Service Manual

ProPass® 200

Preface

The purpose of this publication is to provide the service technician with information for troubleshooting, testing and repair of major systems and components on the ProPass 200.

REFER TO THE OPERATOR'S MANUAL FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. For reference, insert a copy of the Operator's Manual and Parts Catalog for your machine into Chapter 2 of this service manual. Additional copies of the Operator's Manual and Parts Catalog are available on the internet at www.Toro.com.

The Toro Company reserves the right to change product specifications or this publication without notice.

This safety symbol means DANGER, WARNING, or CAUTION, PERSONAL SAFETY INSTRUCTION. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions may result in personal injury.

NOTE: A **NOTE** will give general information about the correct operation, maintenance, service, testing or repair of the machine.

IMPORTANT: The IMPORTANT notice will give important instructions which must be followed to prevent damage to systems or components on the machine.

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Chapter 1

Safety

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General Safety Instructions

The ProPass 200 has been tested and certified by TORO for compliance with existing safety standards and specifications. Although hazard control and accident prevention partially are dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern and proper training of the personnel involved in the operation, transport, maintenance and storage of the machine. Improper use or maintenance of the machine can result in injury or death. To reduce the potential for injury or death, comply with the following safety instructions.

WARNING

To reduce the potential for injury or death, comply with the following safety instructions.

Before Operating

1. Review and understand the contents of the Operator's Manuals before starting and operating the machine. Become familiar with the controls and know how to stop the machine and engine quickly. Additional copies of the Operator's Manual are available on the internet at www.Toro.com.

2. Keep all shields, safety devices and decals in place. If a shield, safety device or decal is defective, illegible or damaged, repair or replace it before operating the machine. Also tighten any loose nuts, bolts or screws to ensure machine is in safe operating condition.

3. Make sure that the tow vehicle is carefully selected to assure the best performance and safe operation of the ProPass machine.

4. Make sure that the operator is familiar with tow vehicle and ProPass operation.

5. Make sure that ProPass is properly secured to tow vehicle before operating.

While Operating

1. The operator should be in the operators position when operating the tow vehicle and ProPass machine. Stay away from the ProPass when the floor and rear option (twin spinner or side conveyor) system are engaged.

2. Do not run engine that powers the ProPass in a confined area without adequate ventilation. Exhaust fumes are hazardous and could possibly be deadly.

3. Do not touch engine, muffler or exhaust pipe while engine is running or soon after it is stopped. These areas could be hot enough to cause burns.

4. If abnormal vibration is detected, stop operation of the ProPass immediately and determine source of vibration. Correct problems before resuming the use of the machine.

5. While operating, the ProPass may exceed noise levels of 85dB(A) at the operator position. Hearing protection is recommended for prolonged exposure to reduce the potential of permanent hearing damage.

6. Do not leave the ProPass unattended when it is running.

7. If ProPass is equipped with a wireless controller, always be in line of sight with the machine when operating, adjusting or programming the wireless controller.

8. Make sure that the ProPass load is distributing evenly to prevent shifting of contents.

9. Before leaving the operator's position of the tow vehicle:

   A. Stop on level ground.

   B. Make sure that ProPass floor is stopped and then disengage spinner system.

   C. Ensure that tow vehicle traction lever is in neutral, set parking brake, stop engine and remove key from ignition switch.

10. Before disconnecting the ProPass tow behind chassis from the tow vehicle, park on level surface, ensure that the front tongue jack is in the support position and chock wheels.

Maintenance and Service

1. The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your ProPass machine. Refer to this publication for additional information when servicing the machine.

2. Before servicing or making adjustments, position ProPass machine on a level surface. Engage tow vehicle parking brake, stop engine and remove key from the ignition switch. If ProPass is equipped with wireless controller, power off wireless controller. On ProPass mounted to a tow behind chassis, chock wheels to prevent it from moving.

3. If equipped, press the E–stop button to disable the ProPass electrical system before working on the machine. Pull the button out when machine is to be returned to use.

4. Make sure machine is in safe operating condition by keeping all nuts, bolts and screws tight.

5. Never store the machine or fuel container inside where there is an open flame, such as near a water heater or furnace.

6. Make sure all hydraulic line connectors are tight and all hydraulic hoses and lines are in good condition before applying pressure to the hydraulic system.

7. Keep body and hands away from pin hole leaks in hydraulic lines that eject high pressure hydraulic fluid. Use cardboard or paper to find hydraulic leaks. Hydraulic fluid escaping under pressure can penetrate skin and cause injury. Hydraulic fluid accidentally injected into the skin must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.

8. Before disconnecting any hydraulic component or performing any work on the hydraulic system, all pressure in system must be relieved. See Relieving Hydraulic System Pressure in the General Information section of Chapter 3 – Hydraulic System.

9. Make sure that electrical power harness from tow vehicle is disconnected before working on the machine's electrical system.

10. If major repairs are ever needed or assistance is desired, contact your Authorized Toro Distributor.

11. At the time of manufacture, the machine conformed to all applicable safety standards. To assure optimum performance and continued safety certification of the machine, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and the warranty may be voided.

12. When changing tires or performing other service on your ProPass machine, use correct hoists and jacks. Make sure machine is parked on a solid level surface such as a concrete floor with the hopper empty. Always chock or block wheels. Use appropriate stands to support the raised machine. If the machine is not properly supported, the machine may move or fall, which may result in personal injury.

Safety and Instruction Decals

Numerous safety and instruction decals are affixed to the ProPass 200. If any decal becomes illegible or damaged, install a new decal. Decal part numbers are listed in your Parts Catalog.

Chapter 2

Product Records and Maintenance

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Product Records

Insert Operator's Manuals and Parts Catalog for your ProPass at the end of this chapter. Additionally, insert Installation Instructions, Operator's Manuals and Parts Catalogs for any accessories that have been installed on your ProPass at the end of this section.

Maintenance

Maintenance procedures and recommended service intervals for your ProPass are covered in the Operator's Manual. Refer to this publications when performing regular equipment maintenance. Several maintenance procedures have break-in intervals identified in the Operator's Manuals. If machine is equipped with the hydraulic power pack, refer to the Engine Owner's Manual for additional engine specific maintenance procedures.

Equivalents and Conversions

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm
1/64	0.015625	— 0.397	33/64	0.515625	— 13.097
1/32	0.03125	— 0.794	17/32	0.53125	— 13.494
3/64	0.046875	— 1.191	35/64	0.546875	— 13.891
1/16	0.0625	— 1.588	9/16	0.5625	— 14.288
5/64	0.078125	— 1.984	37/64	0.578125	— 14.684
3/32	0.09375	— 2.381	19/32	0.59375	— 15.081
7/64	0.109275	— 2.778	39/64	0.609375	— 15.478
1/8	0.1250	— 3.175	**5/8**	0.6250	— 15.875
9/64	0.140625	— 3.572	41/64	0.640625	— 16.272
5/32	0.15625	— 3.969	21/32	0.65625	— 16.669
11/64	0.171875	— 4.366	43/64	0.671875	— 17.066
3/16	0.1875	— 4.762	11/16	0.6875	— 17.462
13/64	0.203125	— 5.159	45/64	0.703125	— 17.859
7/32	0.21875	— 5.556	23/32	0.71875	— 18.256
15/64	0.234375	— 5.953	47/64	0.734375	— 18.653
1/4	0.2500	— 6.350	**3/4**	0.7500	— 19.050
17/64	0.265625	— 6.747	49/64	0.765625	— 19.447
9/32	0.28125	— 7.144	25/32	0.78125	— 19.844
19/64	0.296875	— 7.541	51/64	0.796875	— 20.241
5/16	0.3125	— 7.938	13/16	0.8125	— 20.638
21/64	0.328125	— 8.334	53/64	0.828125	— 21.034
11/32	0.34375	— 8.731	27/32	0.84375	— 21.431
23/64	0.359375	— 9.128	55/64	0.859375	— 21.828
3/8	0.3750	— 9.525	**7/8**	0.8750	— 22.225
25/64	0.390625	— 9.922	57/64	0.890625	— 22.622
13/32	0.40625	— 10.319	29/32	0.90625	— 23.019
27/64	0.421875	— 10.716	59/64	0.921875	— 23.416
7/16	0.4375	— 11.112	15/16	0.9375	— 23.812
29/64	0.453125	— 11.509	61/64	0.953125	— 24.209
15/32	0.46875	— 11.906	31/32	0.96875	— 24.606
31/64	0.484375	— 12.303	63/64	0.984375	— 25.003
1/2	0.5000	— 12.700	**1**	1.000	— 25.400

1 mm = 0.03937 in. **0.001 in. = 0.0254 mm**

U.S.to Metric Conversions

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
	Pounds/Sq. In.	Bar	0.069
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flow	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subract 32° 2. Multiply by 5/9

Torque Specifications

Recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in this Service Manual.

These Torque Specifications for the installation and tightening of fasteners shall apply to all fasteners which do not have a specific requirement identified in this Service Manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (e.g. Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature (e.g. Nylock nut), hardness of the surface underneath the fastener's head or similar condition which affects the installation.

As noted in the following tables, torque values should be **reduced by 25% for lubricated fasteners** to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification

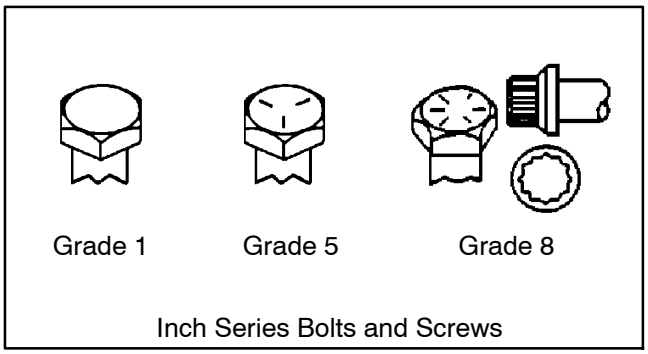

Figure 1

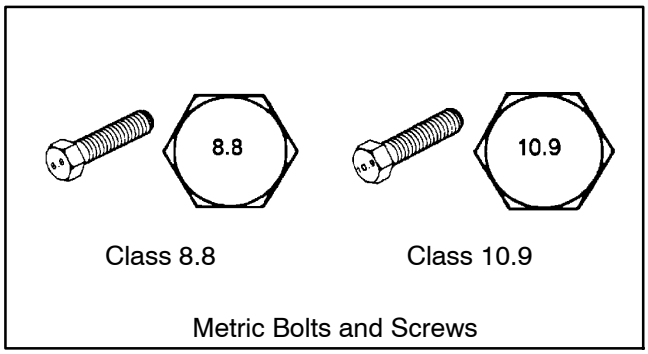

Figure 2

Using a Torque Wrench with an Offset Wrench

Use of an offset wrench (e.g. crowfoot wrench) will affect torque wrench calibration due to the effective change of torque wrench length. When using a torque wrench with an offset wrench, multiply the listed torque recommendation by the calculated torque conversion factor (Fig. 3) to determine proper tightening torque. Tightening torque when using a torque wrench with an offset wrench will be lower than the listed torque recommendation.

Example: The measured effective length of the torque wrench (distance from the center of the handle to the center of the square drive) is 18".

The measured effective length of the torque wrench with the offset wrench installed (distance from the center of the handle to the center of the offset wrench) is 19".

The calculated torque conversion factor for this torque wrench with this offset wrench would be 18 / 19 = 0.947.

If the listed torque recommendation for a fastener is from 76 to 94 ft-lb, the proper torque when using this torque wrench with an offset wrench would be from 72 to 89 ft-lb.

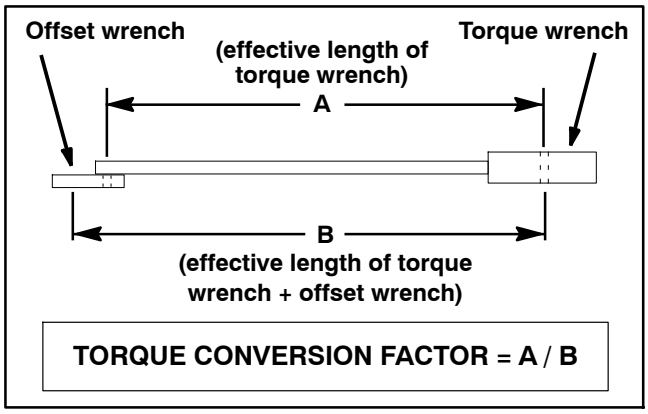

Figure 3

Standard Torque for Dry, Zinc Plated and Steel Fasteners (Inch Series)

Thread Size	Grade 1, 5 & 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE J995 Grade 5 or Stronger Nuts)	
	in-lb	**in-lb**	**N-cm**	**in-lb**	**N-cm**	**in-lb**	**N-cm**
# 6 - 32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	169 ± 23	23 ± 3	262 ± 34
# 6 - 40 UNF				17 ± 2	192 ± 23	25 ± 3	282 ± 34
# 8 - 32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	328 ± 34	41 ± 5	463 ± 56
# 8 - 36 UNF				31 ± 4	350 ± 45	43 ± 5	486 ± 56
# 10 - 24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 5	475 ± 56	60 ± 6	678 ± 68
# 10 - 32 UNF				48 ± 5	542 ± 56	68 ± 7	768 ± 79
1/4 - 20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1130 ± 113	140 ± 15	1582 ± 169
1/4 - 28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 12	1299 ± 136	160 ± 17	1808 ± 192
5/16 - 18 UNC	115 ± 15	105 ± 15	1186 ± 169	200 ± 25	2260 ± 282	300 ± 30	3390 ± 339
5/16 - 24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2542 ± 282	325 ± 33	3672 ± 373
	ft-lb	**ft-lb**	**N-m**	**ft-lb**	**N-m**	**ft-lb**	**N-m**
3/8 - 16 UNC	16 ± 2	16 ± 2	22 ± 3	30 ± 3	41 ± 4	43 ± 5	58 ± 7
3/8 - 24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 4	47 ± 5	50 ± 6	68 ± 8
7/16 - 14 UNC	27 ± 3	27 ± 3	37 ± 4	50 ± 5	68 ± 7	70 ± 7	95 ± 9
7/16 - 20 UNF	29 ± 3	29 ± 3	39 ± 4	55 ± 6	75 ± 8	77 ± 8	104 ± 11
1/2 - 13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 11	142 ± 15
1/2 - 20 UNF	32 ± 4	53 ± 7	72 ± 9	85 ± 9	115 ± 12	120 ± 12	163 ± 16
5/8 - 11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 21	285 ± 28
5/8 - 18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 18	230 ± 24	240 ± 24	325 ± 33
3/4 - 10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 27	359 ± 37	375 ± 38	508 ± 52
3/4 - 16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 30	407 ± 41	420 ± 43	569 ± 58
7/8 - 9 UNC	140 ± 20	225 ± 25	305 ± 34	430 ± 45	583 ± 61	600 ± 60	813 ± 81
7/8 - 14 UNF	155 ± 25	260 ± 30	353 ± 41	475 ± 48	644 ± 65	667 ± 66	904 ± 89

NOTE: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as engine oil or thread sealant such as Loctite.

NOTE: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

NOTE: The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Standard Torque for Dry, Zinc Plated and Steel Fasteners (Metric Series)

Thread Size	Class 8.8 Bolts, Screws and Studs with Regular Height Nuts (Class 8 or Stronger Nuts)		Class 10.9 Bolts, Screws and Studs with Regular Height Nuts (Class 10 or Stronger Nuts)	
M5 X 0.8	57 ± 6 in-lb	644 ± 68 N-cm	78 ± 8 in-lb	881 ± 90 N-cm
M6 X 1.0	96 ± 10 in-lb	1085 ± 113 N-cm	133 ± 14 in-lb	1503 ± 158 N-cm
M8 X 1.25	19 ± 2 ft-lb	26 ± 3 N-m	28 ± 3 ft-lb	38 ± 4 N-m
M10 X 1.5	38 ± 4 ft-lb	52 ± 5 N-m	54 ± 6 ft-lb	73 ± 8 N-m
M12 X 1.75	66 ± 7 ft-lb	90 ± 10 N-m	93 ± 10 ft-lb	126 ± 14 N-m
M16 X 2.0	166 ± 17 ft-lb	225 ± 23 N-m	229 ± 23 ft-lb	310 ± 31 N-m
M20 X 2.5	325 ± 33 ft-lb	440 ± 45 N-m	450 ± 46 ft-lb	610 ± 62 N-m

NOTE: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as engine oil or thread sealant such as Loctite.

NOTE: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

NOTE: The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

Thread Size	Recommended Torque	
	Square Head	Hex Socket
1/4 – 20 UNC	140 ± 20 in-lb	73 ± 12 in-lb
5/16 – 18 UNC	215 ± 35 in-lb	145 ± 20 in-lb
3/8 – 16 UNC	35 ± 10 ft-lb	18 ± 3 ft-lb
1/2 – 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb

Wheel Bolts and Lug Nuts

Thread Size	Recommended Torque**	
7/16 – 20 UNF Grade 5	65 ± 10 ft-lb	88 ± 14 N-m
1/2 – 20 UNF Grade 5	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.25 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.5 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m

** For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

Type 1, Type 23 or Type F	
Thread Size	Baseline Torque*
No. 6 – 32 UNC	20 ± 5 in-lb
No. 8 – 32 UNC	30 ± 5 in-lb
No. 10 – 24 UNC	38 ± 7 in-lb
1/4 – 20 UNC	85 ± 15 in-lb
5/16 – 18 UNC	110 ± 20 in-lb
3/8 – 16 UNC	200 ± 100 in-lb

Thread Cutting Screws (Zinc Plated Steel)

Thread Size	Threads per Inch		Baseline Torque*
	Type A	Type B	
No. 6	18	20	20 ± 5 in-lb
No. 8	15	18	30 ± 5 in-lb
No. 10	12	16	38 ± 7 in-lb
No. 12	11	14	85 ± 15 in-lb

* Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

in-lb X 11.2985 = N-cm
ft-lb X 1.3558 = N-m

N-cm X 0.08851 = in-lb
N-m X 0.7376 = ft-lb

Chapter 3

Hydraulic System

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EATON (CHAR–LYNN) S–SERIES GENERAL PURPOSE MOTORS PARTS and REPAIR MANUAL

EATON (CHAR–LYNN) R–SERIES GENERAL PURPOSE GEROLER MOTOR REPAIR INFORMATION

Specifications

Item	Description
Tow Vehicle Hydraulic Supply Minimum Supply Maximum Supply	 6 US Gal/Min (23 L/Min) @ 2000 PSI (138 Bar) 10 US Gal/Min (38 L/Min) @ 2800 PSI (190 Bar)
Floor Motor Displacement (per revolution)	Eaton fixed displacement geroler motor 22.7 in^3 (371 cc)
Twin Spinner Motors (Rear Option) Displacement (per revolution)	Eaton fixed displacement geroler motor 1.8 in^3 (29 cc)
Conveyor Motor (Rear Option) Displacement (per revolution)	Eaton fixed displacement geroler motor 1.8 in^3 (29 cc)

NOTE: If tow vehicle provides hydraulic supply, use tow vehicle hydraulic specifications for information regarding hydraulic flow and relief pressure to the ProPass. If hydraulic power pack provides hydraulic supply, see Chapter 6 – Hydraulic Power Pack Assembly for information regarding hydraulic circuit flow and relief pressure specifications.

General Information

Operator's Manual

The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your ProPass machine. Refer to that publication for additional information when servicing the machine.

ProPass Hydraulic Supply

Hydraulic supply for the ProPass machine is either provided by the tow vehicle or a hydraulic power pack. If tow vehicle provides hydraulic supply, use tow vehicle hydraulic specifications for information regarding hydraulic flow and relief pressure to the ProPass. If hydraulic power pack provides hydraulic supply, see Chapter 6 – Hydraulic Power Pack Assembly for information regarding hydraulic circuit flow and relief pressure specifications.

NOTE: See Specifications in this chapter for tow vehicle hydraulic supply recommendations.

Hydraulic Hose Kit (Tow Vehicle to ProPass)

The hydraulic hose kit used when a ProPass receives its hydraulic supply from a tow vehicle includes a check valve in the return hose assembly (item 6 in Figure 1). If the check valve is removed from the return hose, make sure that the arrow on the check valve is directed toward the tow vehicle. Also, when connecting the hydraulic hoses to the tow vehicle, use the check valve to identify the return hose for correct installation.

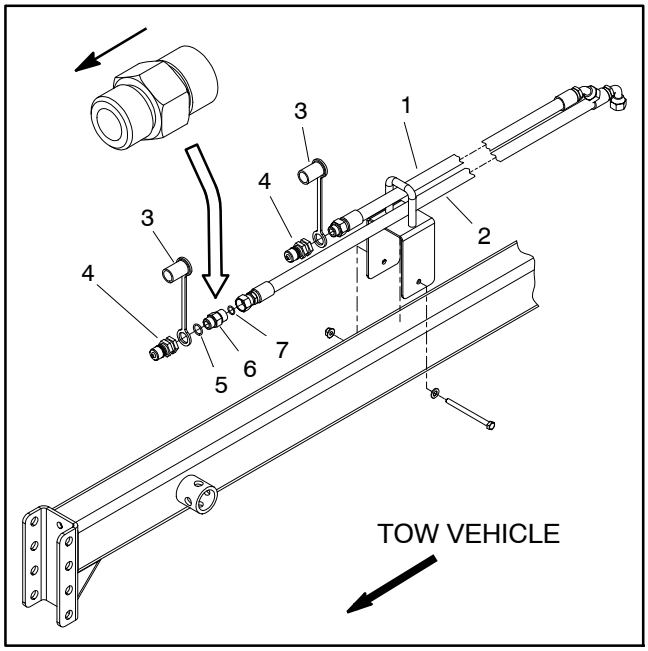


Figure 1

1. **Hydraulic hose (supply)**
2. **Hydraulic hose (return)**
3. **Dust cap**
4. **Male coupler**
5. **O-ring**
6. **Check valve**
7. **O-ring**

Machine Hydraulic Control

ProPass 200 machines use either standard hydraulic controls or electronic hydraulic controls to allow the operator to change machine settings.

Standard Hydraulic Controls

Machines with standard hydraulic controls include manual hydraulic controls on the front of the ProPass hopper to adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 2). A pendant electrical control allows the operator to energize the floor and rear option motors from the operator position of the tow vehicle.

Electronic Hydraulic Controls

Machines with electronic hydraulic controls include a wireless remote to electrically adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 3). The remote allows initial adjustment of the floor and rear option motors as well as making adjustments possible while the machine is operating. An E-Stop button on the machine disables the electrical system to prevent unexpected machine operation.

If there should be a problem with the wireless remote, ProPass machines with electronic controls have manual override adjustments on the driver side of the hydraulic system that will allow continued operation (Fig. 4). A control knob is used to adjust floor speed and a flat blade screwdriver can be used to adjust the rear option speed.

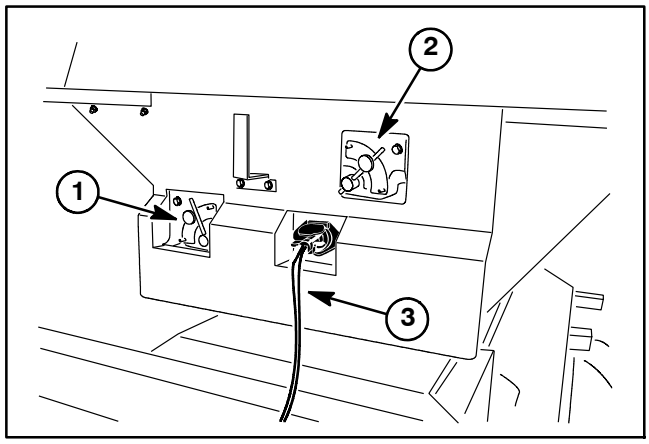


Figure 2

1. **Floor control**
2. **Rear option control**
3. **Pendant harness**

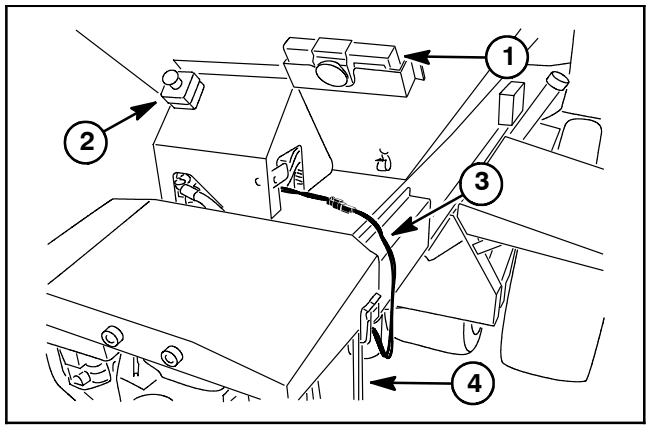


Figure 3

1. **Wireless remote**
2. **E-Stop button**
3. **Power lead harness**
4. **Optional power pack**

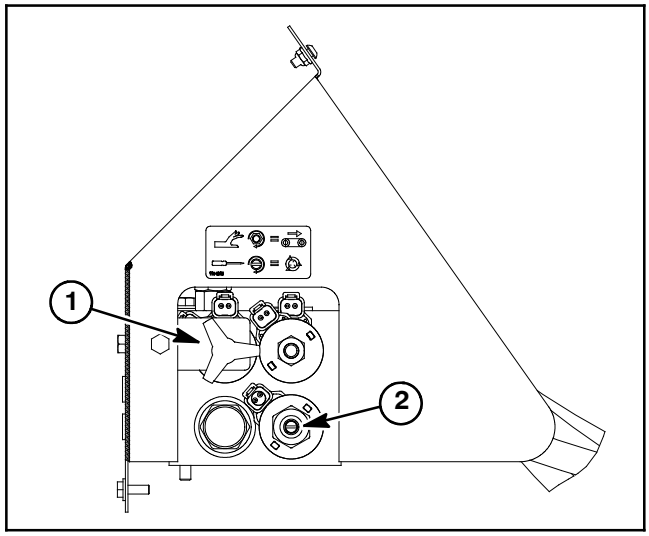


Figure 4

1. **Control knob**
2. **Screwdriver slot**

Rear Option

The ProPass includes the twin spinner that is used for topdressing (Fig. 5). The twin spinner uses two (2) hydraulic motors for operation. The cross conveyor and swivel is available as an option for delivery of material from the ProPass hopper (Fig. 6). The conveyor uses one (1) hydraulic motor for operation.

The ProPass hydraulic system is used to operate either of these rear options.

Figure 5

Figure 6

Relieving Hydraulic System Pressure

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil.

Before disconnecting or performing any work on the ProPass hydraulic system, all pressure in the hydraulic system must be relieved. Position machine on a level surface. Turn tow vehicle key switch to OFF and allow engine to stop. If ProPass is equipped with hydraulic power pack, make sure that power pack engine is turned off.

Make sure that the ProPass has electrical power and that controls are operational. With the tow vehicle engine not running, use the pendant control or wireless controller to energize the hydraulic solenoids for the floor and rear option (twin spinner or conveyor) motors. After both hydraulic functions have been energized, turn tow vehicle key switch OFF and remove key from ignition switch.

Hydraulic Hoses

Hydraulic hoses are subject to extreme conditions such as pressure differentials during operation and exposure to weather, sun, chemicals, very warm storage conditions or mishandling during operation and maintenance. These conditions can cause hose damage and deterioration. Some hoses are more susceptible to these conditions than others. Inspect all machine hydraulic hoses frequently for signs of deterioration or damage:

Hard, cracked, cut, abraded, charred, leaking or otherwise damaged hose.

Kinked, crushed, flattened or twisted hose.

Blistered, soft, degraded or loose hose cover.

Cracked, damaged or badly corroded hose fittings.

When replacing a hydraulic hose, be sure that the hose is straight (not twisted) before tightening the fittings. This can be done by observing the imprint (layline) on the hose. Use two (2) wrenches; hold the hose straight with one wrench and tighten the hose swivel nut onto the fitting with the second wrench (see Hydraulic Hose and Tube Installation in this section). If the hose has an elbow at one end, tighten the swivel nut on that end before tightening the nut on the straight end of the hose.

For additional hydraulic hose information, refer to Toro Service Training Book, Hydraulic Hose Servicing (Part Number 94813SL).

WARNING

Before disconnecting or performing any work on hydraulic system, relieve all pressure in system (see Relieving Hydraulic System Pressure in this section).

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and cause serious injury. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result from such an injury.

Hydraulic Hose and Tube Installation (O-Ring Face Seal Fittings)

NOTE: ProPass machines with serial numbers above 310001000 use O-ring face seal fittings (Fig. 7). Use the following information when installing hydraulic hoses and tubes to O-ring face seal fittings.

1. Make sure threads and sealing surfaces of the hose/tube and the fitting are free of burrs, nicks, scratches or any foreign material.

2. As a preventative measure against leakage, it is recommended that the face seal O-ring be replaced any time the connection is opened. Make sure the O-ring is installed and properly seated in the fitting groove. Lightly lubricate the O-ring with clean hydraulic oil.

3. Place the hose/tube against the fitting body so that the flat face of the hose/tube sleeve fully contacts the O-ring in the fitting.

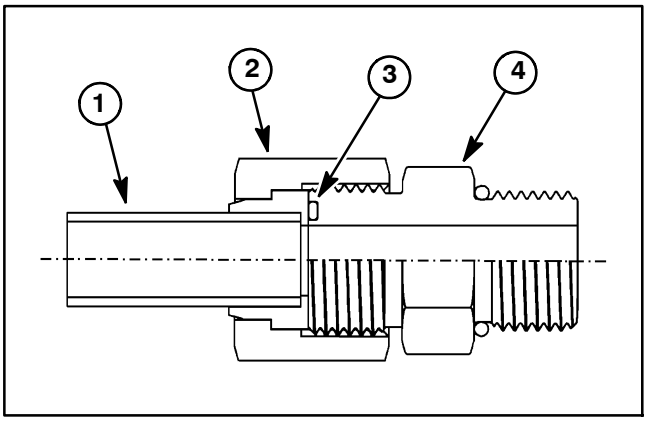


Figure 7

1. **Hydraulic hose/tube**
2. **Swivel nut**
3. **O-ring**
4. **Fitting body**

4. Thread the hose/tube swivel nut onto the fitting by hand. While holding the hose/tube with a wrench, use a torque wrench to tighten the swivel nut to the recommended installation torque shown in Figure 9. This tightening process will require the use of an offset wrench (e.g. crowfoot wrench). Use of an offset wrench will affect torque wrench calibration due to the effective length change of the torque wrench. Tightening torque when using a torque wrench with an offset wrench will be lower than the listed installation torque (see Using a Torque Wrench with an Offset Wrench in the Torque Specifications section of Chapter 2 – Product Records and Maintenance).

5. If a torque wrench is not available or if space at the swivel nut prevents use of a torque wrench, an alternate method of assembly is the Flats From Wrench Resistance (F.F.W.R.) method (Fig. 8).

A. Using a wrench, tighten the swivel nut onto the fitting until light wrench resistance is reached (approximately 30 in–lb).

B. Mark the swivel nut and fitting body. Hold the hose/tube with a wrench to prevent it from turning.

C. Use a second wrench to tighten the nut to the correct Flats From Wrench Resistance (F.F.W.R.). The markings on the nut and fitting body will verify that the connection has been properly tightened.

Size	F.F.W.R.
4 (1/4 in. nominal hose or tubing)	1/2 to 3/4
6 (3/8 in.)	1/2 to 3/4
8 (1/2 in.)	1/2 to 3/4
10 (5/8 in.)	1/2 to 3/4
12 (3/4 in.)	1/3 to 1/2
16 (1 in.)	1/3 to 1/2

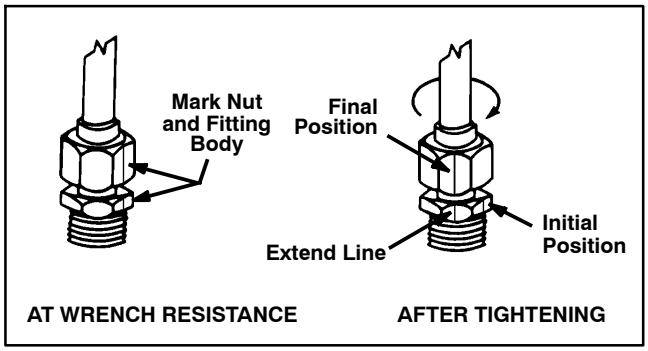


Figure 8

Fitting Dash Size	Hose/Tube Side Thread Size	Installation Torque
4	9/16 – 18	18 to 22 ft–lb (25 to 29 N–m)
6	11/16 – 16	27 to 33 ft–lb (37 to 44 N–m)
8	13/16 – 16	37 to 47 ft–lb (51 to 63 N–m)
10	1 – 14	60 to 74 ft–lb (82 to 100 N–m)
12	1 3/16 – 12	85 to 105 ft–lb (116 to 142 N–m)
16	1 7/16 – 12	110 to 136 ft–lb (150 to 184 N–m)
20	1 11/16 – 12	140 to 172 ft–lb (190 to 233 N–m)

Figure 9

Hydraulic Hose and Tube Installation (JIC Flared Fittings)

NOTE: ProPass machines with serial numbers below 310001000 use JIC flared fittings (Fig. 10). Use the following information when installing hydraulic hoses and tubes to JIC flared fittings.

1. Make sure threads and sealing surfaces of the hose/tube and the fitting are free of burrs, nicks, scratches or any foreign material.

2. Thread hose/tube swivel nut onto fitting by hand. While holding the hose/tube with a wrench, use a torque wrench to tighten swivel nut to the recommended installation torque shown in Figure 12. If fitting is non–ferrous material (e.g. brass), use 50% of listed torque values. This tightening process will require the use of an offset wrench (e.g. crowfoot wrench) that will affect torque wrench calibration due to the effective length change of the torque wrench. Tightening torque when using a torque wrench with an offset wrench will be lower than the listed installation torque (see Using a Torque Wrench with an Offset Wrench in the Torque Specifications section of Chapter 2 – Product Records and Maintenance).

3. If a torque wrench is not available or if space at the swivel nut prevents use of a torque wrench, an alternate method of assembly is the Flats From Wrench Resistance (F.F.W.R.) method (Fig. 11).

   A. Using a wrench, tighten the swivel nut onto the fitting until light wrench resistance is reached (approximately 30 in–lb).

   B. Mark the swivel nut and fitting body. Hold the hose/tube with a wrench to prevent it from turning.

   C. Use a second wrench to tighten the nut to the correct Flats From Wrench Resistance (F.F.W.R.). The markings on the nut and fitting body will verify that the connection has been properly tightened.

Size	F.F.W.R.
4 (1/4 in. nominal hose or tubing)	1/2 to 3/4
6 (3/8 in.)	1/2 to 3/4
8 (1/2 in.)	1/2 to 3/4
10 (5/8 in.)	1/2 to 3/4
12 (3/4 in.)	1/3 to 1/2
16 (1 in.)	1/3 to 1/2

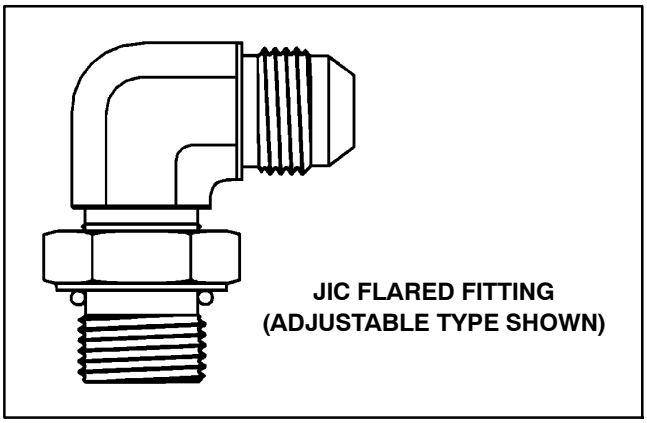


Figure 10

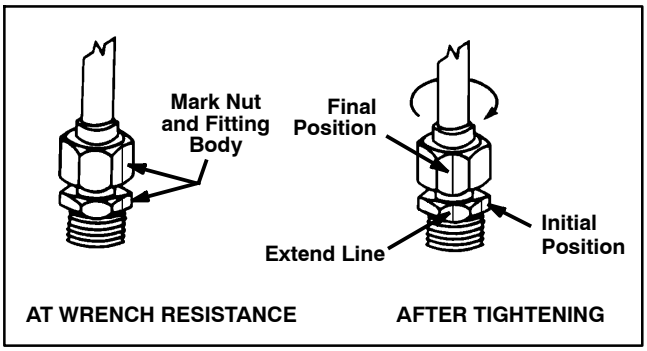


Figure 11

Fitting Dash Size	Hose/Tube Side Thread Size	Installation Torque
4	7/16 – 20	10 to 14 ft–lb (14 to 18 N–m)
6	9/16 – 18	15 to 21 ft–lb (21 to 28 N–m)
8	3/4 – 16	33 to 41 ft–lb (45 to 55 N–m)
10	7/8 – 14	43 to 53 ft–lb (59 to 71 N–m)
12	1 1/16 – 12	66 to 82 ft–lb (90 to 111 N–m)
14	1 3/16 – 12	80 to 98 ft–lb (109 to 132 N–m)
16	1 5/16 – 12	90 to 110 ft–lb (122 to 149 N–m)

Figure 12

Hydraulic O-Ring Face Seal (ORFS) Fitting Installation (SAE Straight Thread O-Ring Fitting into Component Port)

NOTE: ProPass machines with serial numbers above 310001000 use O-ring face seal fittings. Use the following information when installing O-ring face seal fittings.

Non-Adjustable Fitting (Fig. 13)

1. Make sure all threads and sealing surfaces of fitting and component port are free of burrs, nicks, scratches or any foreign material.

2. As a preventative measure against leakage, it is recommended that the O-ring be replaced any time the connection is opened.

3. Lightly lubricate the O-ring with clean hydraulic oil. Fitting threads should be clean with no lubricant applied.

IMPORTANT: Before installing fitting into port, determine port material. If fitting is to be installed into an aluminum port, installation torque is reduced.

4. Install the fitting into the port. Then, use a torque wrench and socket to tighten the fitting to the recommended installation torque shown in Figure 14.

NOTE: Use of an offset wrench (e.g. crowfoot wrench) will affect torque wrench calibration due to the effective length change of the torque wrench. Tightening torque when using a torque wrench with an offset wrench will be less than the recommended installation torque. See Using a Torque Wrench with an Offset Wrench in the Torque Specifications section of Chapter 2 - Product Records and Maintenance to determine necessary conversion information.

5. If a torque wrench is not available, or if space at the port prevents use of a torque wrench, an alternate method of assembly is the Flats From Finger Tight (F.F.F.T.) method.

A. Install the fitting into the port and tighten it down full length until finger tight.

B. If port material is steel, tighten the fitting to the listed F.F.F.T. If port material is aluminum, tighten fitting to 60% of listed F.F.F.T.

Size	F.F.F.T.
4 (1/4 in. nominal hose or tubing)	1.00 ± 0.25
6 (3/8 in.)	1.50 ± 0.25
8 (1/2 in.)	1.50 ± 0.25
10 (5/8 in.)	1.50 ± 0.25
12 (3/4 in.)	1.50 ± 0.25
16 (1 in.)	1.50 ± 0.25

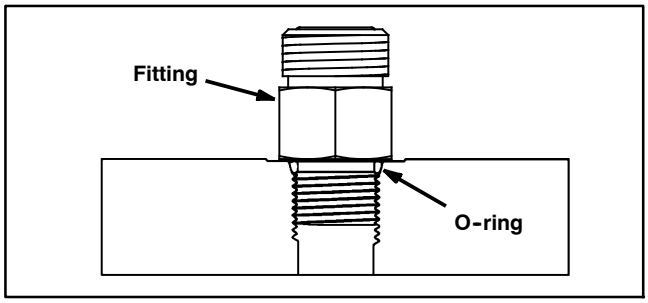


Figure 13

Fitting Dash Size	Fitting Port Side Thread Size	Installation Torque Into Steel Port	Installation Torque Into Aluminum Port
4	7/16 - 20	15 to 19 ft-lb (21 to 25 N-m)	9 to 11 ft-lb (13 to 15 N-m)
6	9/16 - 18	34 to 42 ft-lb (47 to 56 N-m)	20 to 26 ft-lb (28 to 35 N-m)
8	3/4 - 16	58 to 72 ft-lb (79 to 97 N-m)	35 to 43 ft-lb (48 to 58 N-m)
10	7/8 - 14	99 to 121 ft-lb (135 to 164 N-m)	60 to 74 ft-lb (82 to 100 N-m)
12	1 1/16 - 12	134 to 164 ft-lb (182 to 222 N-m)	81 to 99 ft-lb (110 to 134 N-m)
14	1 3/16 - 12	160 to 196 ft-lb (217 to 265 N-m)	96 to 118 ft-lb (131 to 160 N-m)
16	1 5/16 - 12	202 to 248 ft-lb (274 to 336 N-m)	121 to 149 ft-lb (165 to 202 N-m)
20	1 5/8 - 12	247 to 303 ft-lb (335 to 410 N-m)	149 to 183 ft-lb (202 to 248 N-m)

Figure 14

Adjustable Fitting (Fig. 15)

1. Make sure all threads and sealing surfaces of fitting and component port are free of burrs, nicks, scratches or any foreign material.

2. As a preventative measure against leakage, it is recommended that the O-ring be replaced any time the connection is opened.

3. Lightly lubricate the O-ring with clean hydraulic oil. Fitting threads should be clean with no lubricant applied.

4. Turn back the lock nut as far as possible. Make sure the back up washer is not loose and is pushed up as far as possible (Step 1 in Figure 16).

IMPORTANT: Before installing fitting into port, determine port material. If fitting is to be installed into an aluminum port, installation torque is reduced.

5. Install the fitting into the port and tighten finger tight until the washer contacts the face of the port (Step 2 in Figure 16).

6. To put the fitting in the desired position, unscrew it by the required amount, but no more than one full turn (Step 3 in Figure 16).

7. Hold the fitting in the desired position with a wrench and use a torque wrench to tighten the fitting to the recommended installation torque shown in Figure 14. This tightening process will require the use of an offset wrench (e.g. crowfoot wrench). Use of an offset wrench will affect torque wrench calibration due to the effective length change of the torque wrench. Tightening torque when using a torque wrench with an offset wrench will be lower than the listed installation torque (see Using a Torque Wrench with an Offset Wrench in the Torque Specifications section of Chapter 2 – Product Records and Maintenance).

8. If a torque wrench is not available, or if space at the port prevents use of a torque wrench, an alternate method of assembly is the Flats From Finger Tight (F.F.F.T.) method. Hold the fitting in the desired position with a wrench and, if port material is steel, tighten the lock nut with a second wrench to the listed F.F.F.T (Step 4 in Figure 16). If port material is aluminum, tighten fitting to 60% of listed F.F.F.T.

Size	F.F.F.T.
4 (1/4 in. nominal hose or tubing)	1.00 ± 0.25
6 (3/8 in.)	1.50 ± 0.25
8 (1/2 in.)	1.50 ± 0.25
10 (5/8 in.)	1.50 ± 0.25
12 (3/4 in.)	1.50 ± 0.25
16 (1 in.)	1.50 ± 0.25

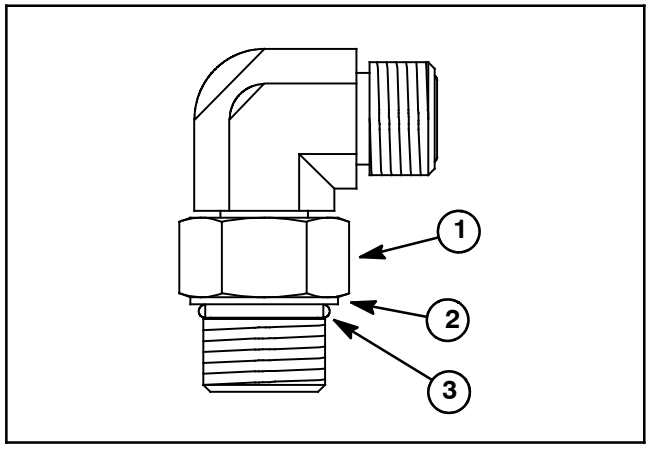


Figure 15

1. **Lock nut**
2. **Back-up washer**
3. **O-ring**

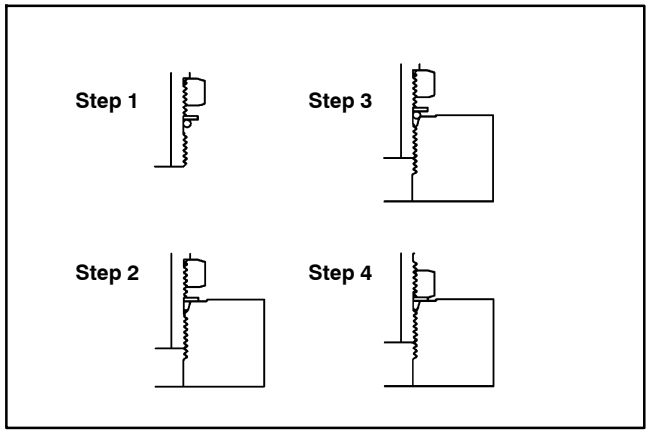


Figure 16

Hydraulic JIC Flared Fitting Installation (JIC Flared Fitting into Component Port)

NOTE: ProPass machines with serial numbers below 310001000 use JIC flared fittings (Fig. 10). Use the following information when installing JIC flared fittings.

When installing a JIC flared fitting into a component port, follow the same procedures as listed in Hydraulic O–Ring Face Seal (ORFS) Fitting Installation (SAE Straight Thread O–Ring Fitting into Component Port) found earlier in this section. The only difference needed for installation of JIC flared fittings is the tightening torque.

Use the following torque values when installing JIC flared fittings into a steel or aluminum component port.

IMPORTANT: If fitting is non–ferrous material (e.g. brass fitting), use installation torque for aluminum port.

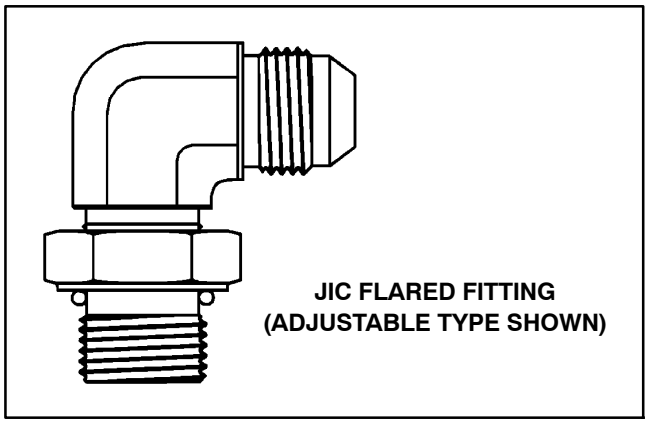
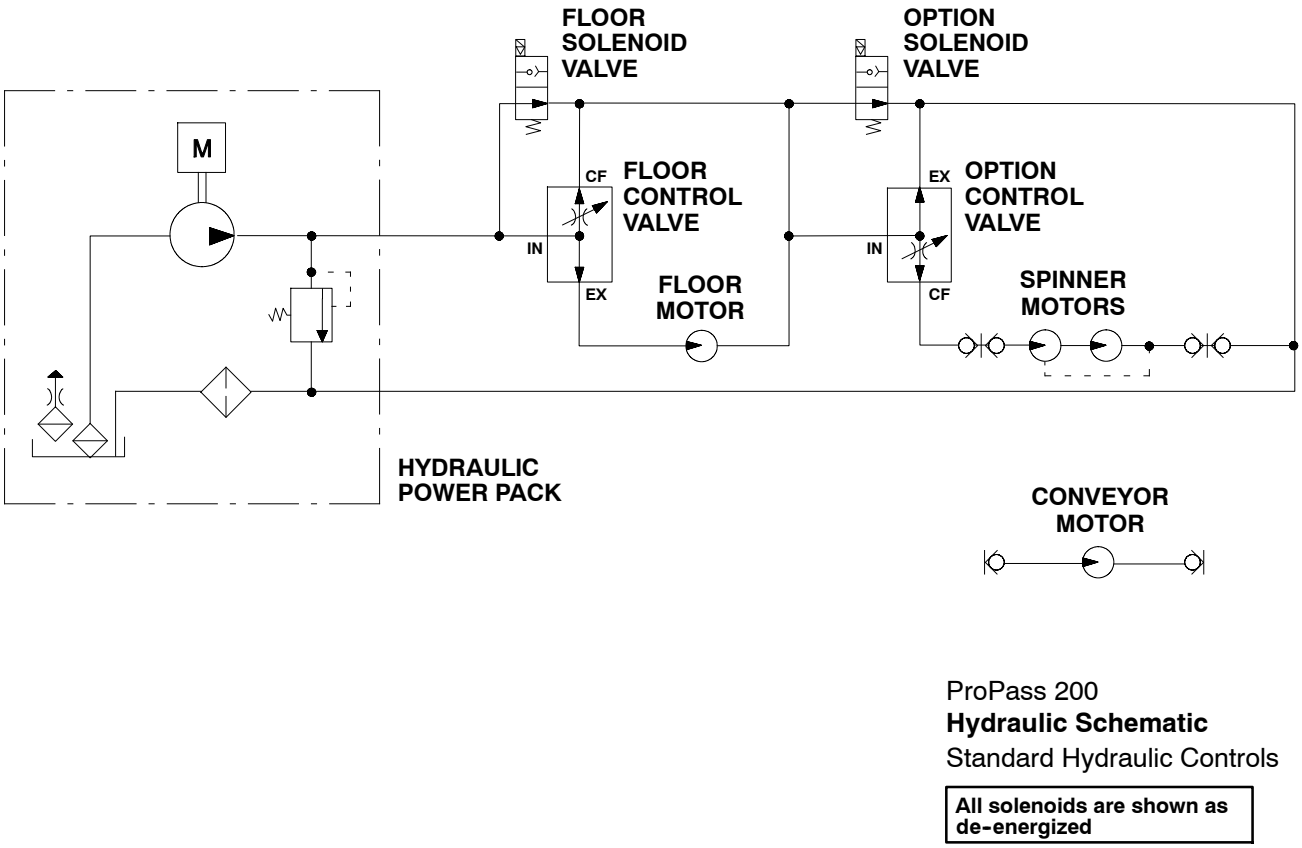


Figure 17

Fitting Dash Size	Fitting Port Side Thread Size	Installation Torque Into Steel Port	Installation Torque Into Aluminum Port
4	7/16 – 20	13 to 17 ft–lb (18 to 23 N–m)	7 to 9 ft–lb (10 to 12 N–m)
6	9/16 – 18	23 to 29 ft–lb (32 to 39 N–m)	11 to 15 ft–lb (15 to 20 N–m)
8	3/4 – 16	46 to 58 ft–lb (63 to 78 N–m)	23 to 29 ft–lb (32 to 39 N–m)
10	7/8 – 14	69 to 85 ft–lb (94 to 115 N–m)	35 to 43 ft–lb (48 to 58 N–m)
12	1 1/16 – 12	105 to 129 ft–lb (143 to 174 N–m)	53 to 65 ft–lb (72 to 88 N–m)
14	1 3/16 – 12	139 to 171 ft–lb (189 to 231 N–m)	70 to 86 ft–lb (95 to 116 N–m)
16	1 5/16 – 12	153 to 187 ft–lb (208 to 253 N–m)	76 to 94 ft–lb (103 to 127 N–m)
20	1 5/8 – 12	213 to 261 ft–lb (289 to 353 N–m)	107 to 131 ft–lb (145 to 177 N–m)

Figure 18

Hydraulic Schematics



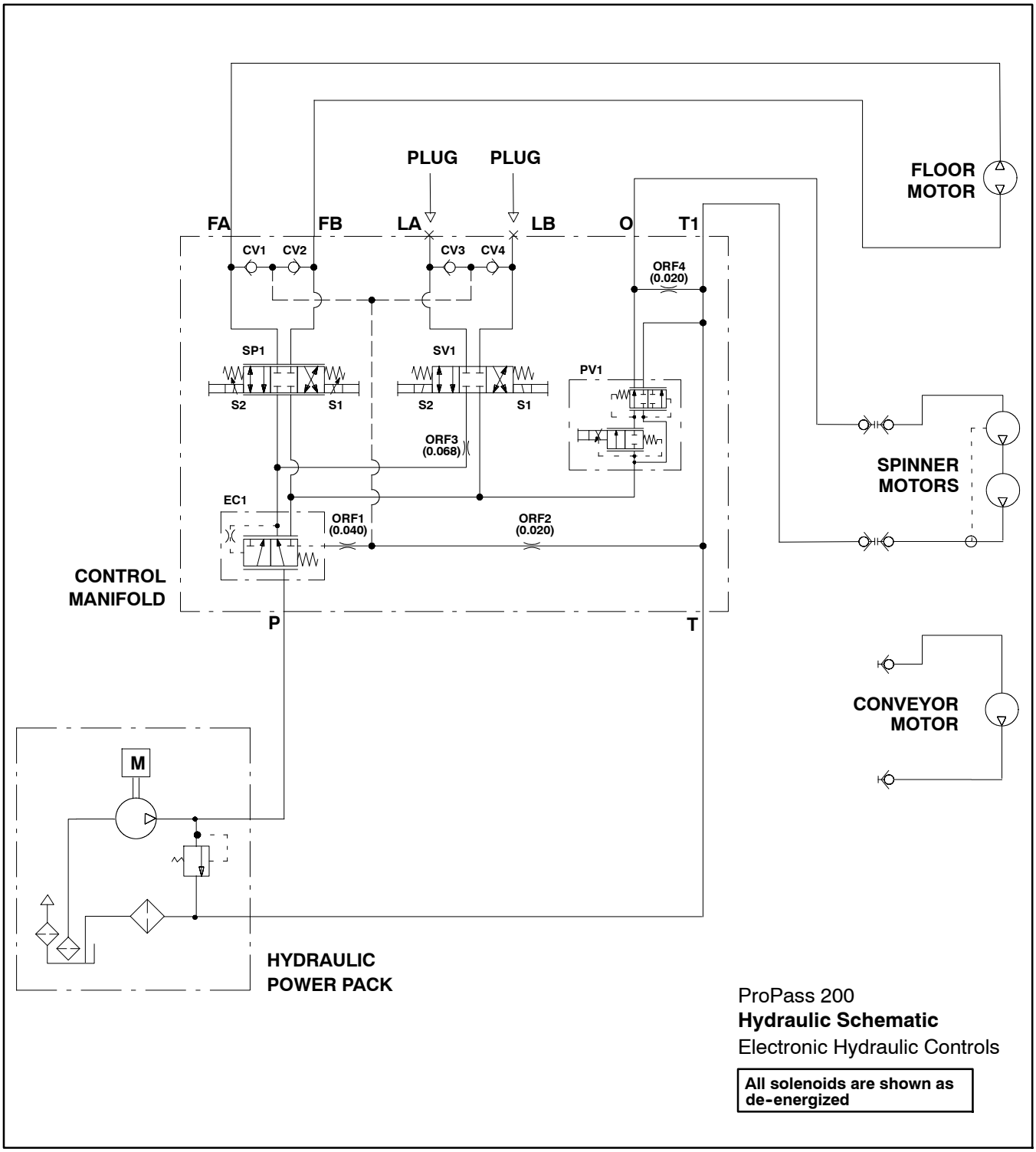
ProPass 200
Hydraulic Schematic
Standard Hydraulic Controls

All solenoids are shown as de-energized

NOTE: The hydraulic schematic shown above includes the hydraulic power pack as the hydraulic supply source. If your ProPass uses hydraulic supply from the tow vehicle, the vehicle includes the hydraulic pump, relief valve and hydraulic reservoir that are used for the ProPass.

NOTE: The rear option is either the twin spinner (two motors) or the cross conveyor (one motor).

NOTE: The hydraulic hose kit used when a ProPass receives its hydraulic supply from a tow vehicle includes a check valve in the return hose assembly (see Hydraulic Hose Kit in the General Information section of this chapter).



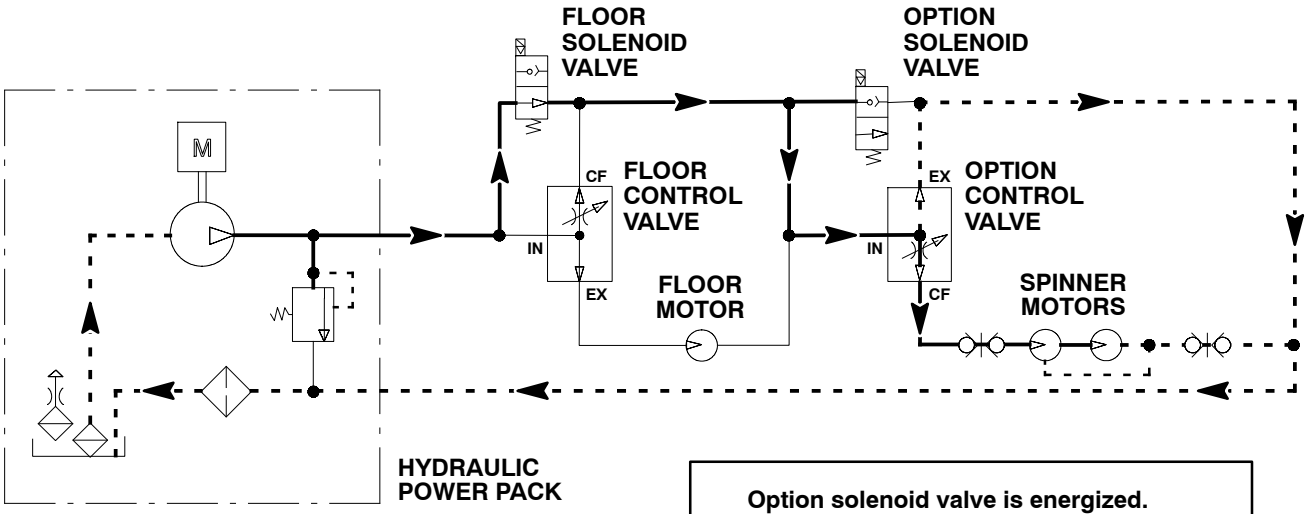
NOTE: The hydraulic schematic shown above includes the hydraulic power pack as the hydraulic supply source. If your ProPass uses hydraulic supply from the tow vehicle, the vehicle includes the hydraulic pump, relief valve and hydraulic reservoir that are used for the ProPass.

NOTE: The rear option is either the twin spinner (two motors) or the cross conveyor (one motor).

NOTE: The hydraulic hose kit used when a ProPass receives its hydraulic supply from a tow vehicle includes a check valve in the return hose assembly (see Hydraulic Hose Kit in the General Information section of this chapter).

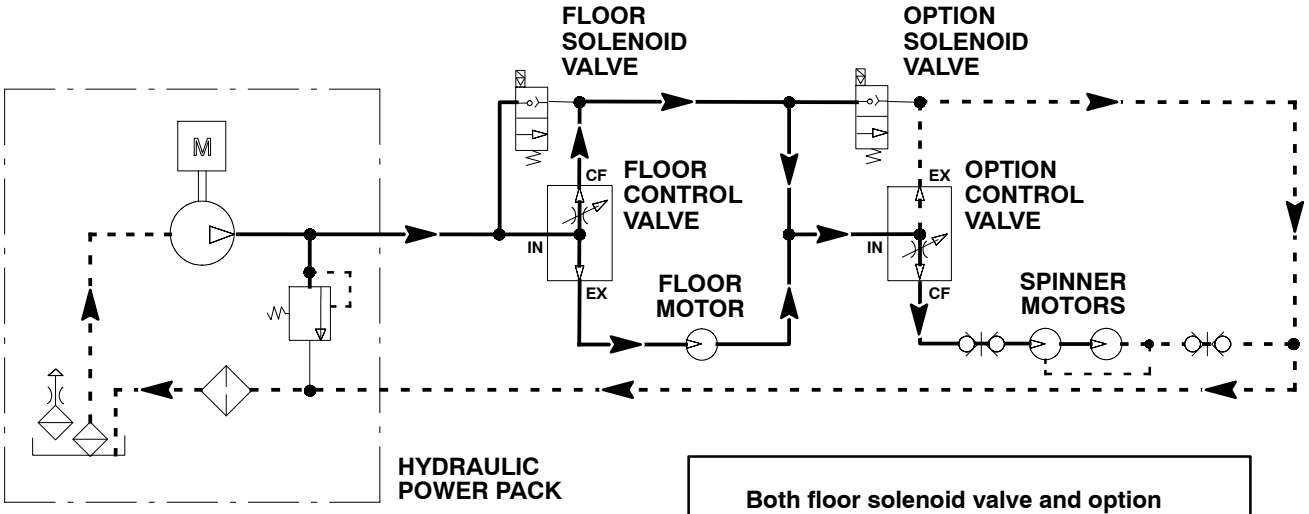
Hydraulic Flow Diagrams: Standard Hydraulic Controls

REAR OPTION CIRCUIT (TWIN SPINNER SHOWN)



Option solenoid valve is energized. Excess and return flow will be routed to hydraulic reservoir.

FLOOR CIRCUIT



Both floor solenoid valve and option solenoid valve are energized. Excess and return flow will be routed to hydraulic reservoir.

Working Pressure
Return
Flow

Rear Option Circuit (Twin Spinner or Conveyor)

Machines with standard hydraulic controls include manual hydraulic controls on the front of the ProPass hopper to adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 19). A pendant electrical control allows the operator to energize the floor and rear option motors from the operator position of the tow vehicle. The ProPass hydraulic system with standard hydraulic controls can function whenever hydraulic flow is available from the tow vehicle or hydraulic power pack.

If neither the floor motor or rear option (twin spinner or conveyor) motors are engaged, hydraulic flow bypasses the motors and returns directly to the hydraulic reservoir. The floor and rear option will remain in the stationary positions.

NOTE: Typically, the rear option (twin spinner or conveyor) is engaged before the floor is started.

When the operator engages the rear option (twin spinner or conveyor) motors, the rear option solenoid valve is energized which directs hydraulic flow to the rear option control valve. The rear option control valve directs hydraulic flow to the rear option motors based on the control valve setting to allow the option to operate at the correct speed for topdressing material to be delivered. System hydraulic flow in excess of the rear option control valve setting is returned to the reservoir. Return from the rear option motors is routed to the reservoir as well.

Hydraulic circuit pressure is controlled by the system relief valve either on the tow vehicle or hydraulic power pack.

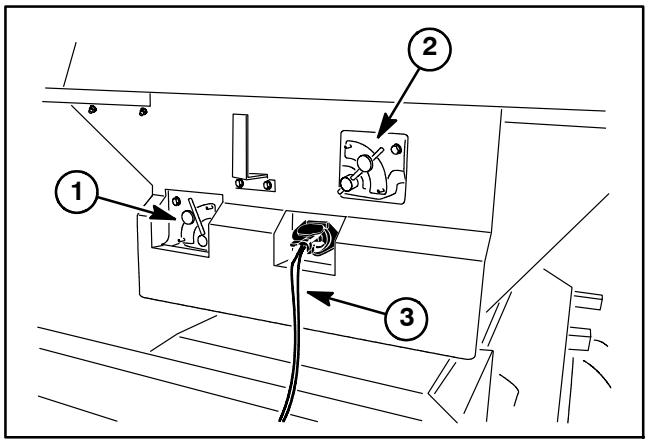


Figure 19

1. **Floor control**
2. **Rear option control**
3. **Pendant harness**

Floor Circuit

Machines with standard hydraulic controls include manual hydraulic controls on the front of the ProPass hopper to adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 19). A pendant electrical control allows the operator to energize the floor and rear option motors from the operator position of the tow vehicle. The ProPass hydraulic system with standard hydraulic controls can function whenever hydraulic flow is available from the tow vehicle or hydraulic power pack.

If neither the floor motor or rear option (twin spinner or conveyor) motors are engaged, hydraulic flow bypasses the motors and returns directly to the hydraulic reservoir. The floor and rear option will remain in the stationary positions.

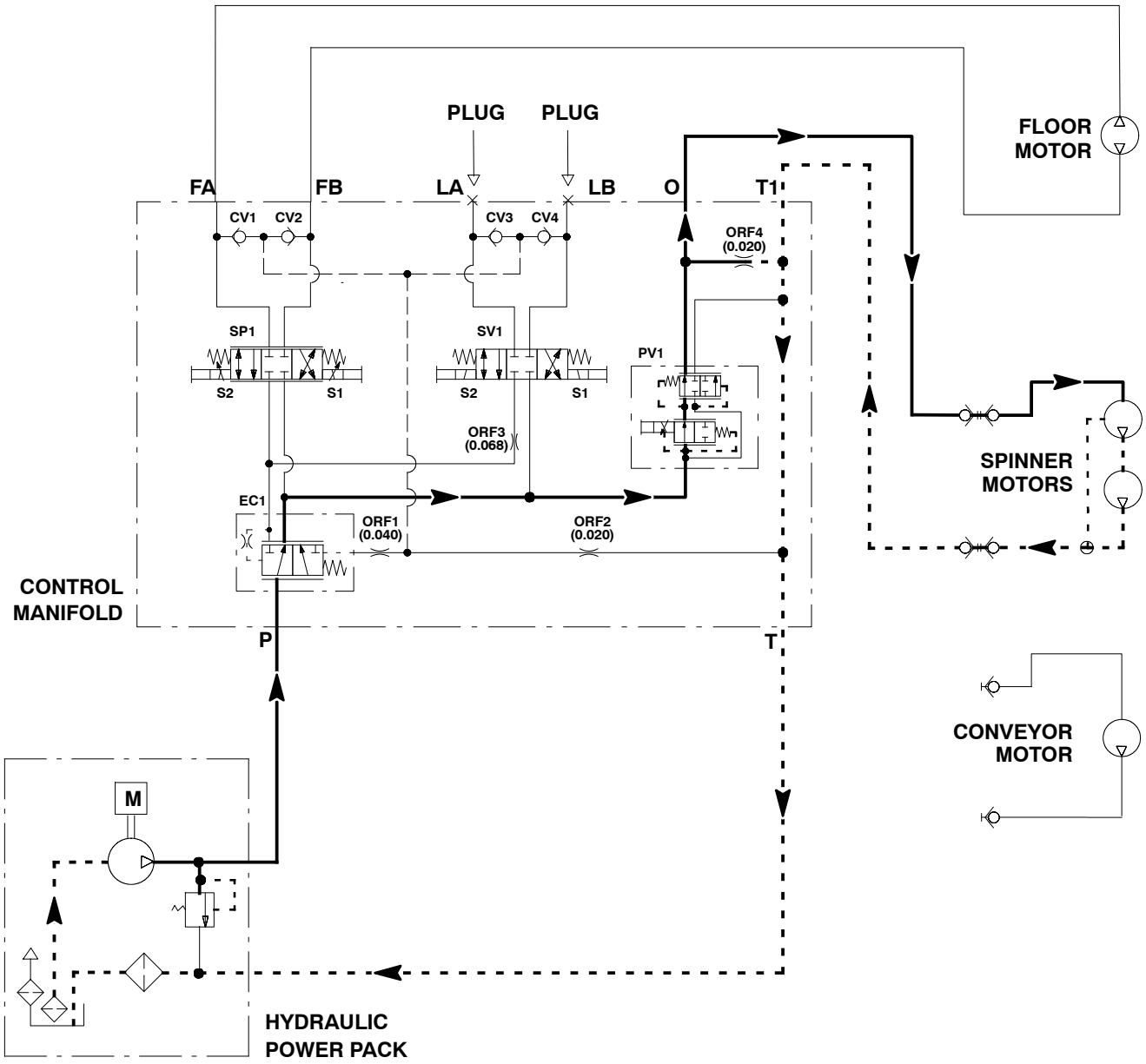
NOTE: Typically, the rear option (twin spinner or conveyor) is engaged before the floor is started.

When the operator engages the floor motor, the floor solenoid valve is energized which directs hydraulic flow to the floor control valve. The floor control valve directs hydraulic flow to the floor motor based on the control valve setting to allow the floor to operate at the correct speed for topdressing material to be delivered to the rear option (twin spinner or conveyor). System hydraulic flow in excess of the floor control valve setting along with floor motor return flow is available for the rear option.

Hydraulic circuit pressure is controlled by the system relief valve either on the tow vehicle or hydraulic power pack.

Hydraulic Flow Diagrams: Electronic Hydraulic Controls

REAR OPTION CIRCUITS (TWIN SPINNER OR CONVEYOR)



SP1 is not energized.
PV1 is energized.
Both EC1 and PV1 shift to allow flow to rear option motors.
Excess and return flow will be routed to hydraulic reservoir.

Working Pressure
Return
Flow

Rear Option Circuits (Twin Spinner or Conveyor)

Machines with electronic hydraulic controls include a wireless remote to electrically adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 20). A hydraulic control manifold is used to control circuit hydraulic flow from the hydraulic oil supply source (tow vehicle or hydraulic power pack). The control manifold includes cartridge valves for control of the rear option (twin spinner or conveyor) and floor circuits.

Control manifold pressure compensator valve (EC1) is used to provide priority flow in the required amount to the floor motor while allowing excess flow to be used for operation of the rear option motors. If the floor circuit is not engaged, the pressure compensator valve directs all of the hydraulic flow toward the rear option motors and return to the hydraulic reservoir.

Control manifold proportional flow valve (PV1) is a priority–type flow regulator with pressure compensated bypass flow. Priority hydraulic flow from this valve is to the rear option motors. Based on wireless remote settings, electrical voltage to valve (PV1) is supplied by the base unit. Valve (PV1) includes manual adjustment for machine operation should the wireless controller be lost, damaged or faulty.

NOTE: The schematic symbols for the pressure compensator valve (EC1) and proportional flow valve (PV1) include lines above and below the valve symbols which designate infinite positioning of the valve spools. These valves appear to be two (2) position valves but in operation, the valves will shift to provide necessary flow to both the floor motor and to the rear option motors based on control settings.

Control manifold proportional solenoid valve (SP1) is used to allow flow to the floor motor. Based on wireless remote settings, electrical voltage to valve (SP1) is supplied by the base unit. Solenoid valve (SP1) includes manual adjustment for machine operation should the wireless controller be lost, damaged or faulty.

NOTE: Control manifold solenoid valve SV1 is not used in ProPass 200 machines. This valve is included in the manifold for use on other machines that also use this same manifold.

If neither the floor motor or rear option (twin spinner or conveyor) motors are engaged, none of the hydraulic control manifold solenoid valve coils are energized. Hydraulic flow is prevented through the unshifted solenoid valves causing the pressure compensator valve (EC1) and proportional flow valve (PV1) to shift. These two (2) valves route hydraulic flow back to the hydraulic reservoir, bypassing the floor and rear option motors. The floor and rear option will remain in the stationary positions.

NOTE: Typically, the rear option (twin spinner or conveyor) is engaged before the floor is started.

When the operator engages the rear option (twin spinner or conveyor), the solenoid coil on proportional flow valve (PV1) is energized by an output from the base unit. The shifted PV1 valve directs hydraulic flow to the rear option motors. To allow the proper motor speed, the base unit supplies the necessary voltage to the PV1 solenoid coil based on settings of the wireless remote. Flow from the PV1 valve is proportional to current applied to the valve coil by the base unit. System hydraulic flow in excess of the rear option control valve setting is returned to the reservoir. Return from the rear option motors is routed to the reservoir as well.

Orifice fitting ORF4 is included in the rear option circuit to ensure that proportional flow valve (PV1) provides the necessary flow to the rear option motors.

Hydraulic circuit pressure is controlled by the system relief valve either on the tow vehicle or hydraulic power pack.

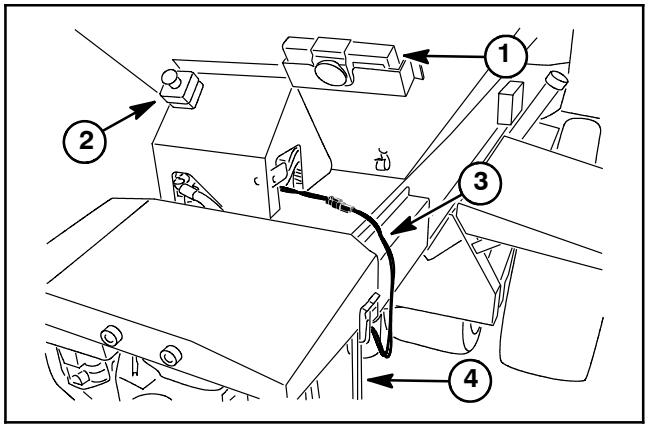
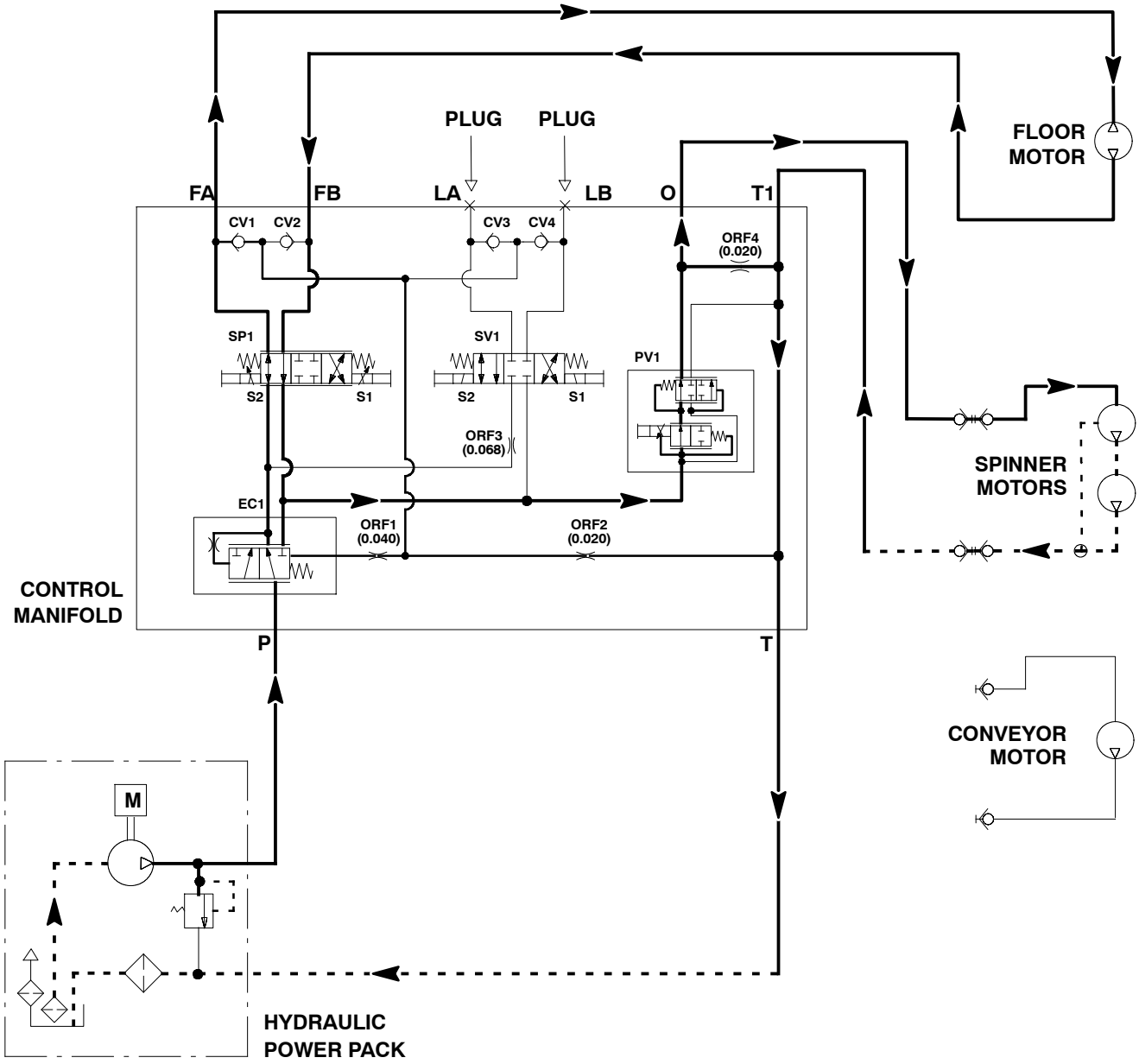


Figure 20

1. **Wireless remote**
2. **E-Stop button**
3. **Power lead harness**
4. **Optional power pack**

FLOOR CIRCUIT



SP1 and PV1 are both energized.
Both EC1 and PV1 shift to allow proportional flow to rear option and floor motors.
Excess and return flow will be directed to hydraulic reservoir.

Working Pressure
Return
Flow

Floor Circuit

Machines with electronic hydraulic controls include a wireless remote to electrically adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 21). A hydraulic control manifold is used to control circuit hydraulic flow from the hydraulic oil supply source (tow vehicle or hydraulic power pack). The control manifold includes cartridge valves for control of the rear option (twin spinner or conveyor) and floor circuits.

Control manifold pressure compensator valve (EC1) is used to provide priority flow in the required amount to the floor motor while allowing excess flow to be used for operation of the rear option motors. If the floor circuit is not engaged, the pressure compensator valve directs all of the hydraulic flow toward the rear option motors and return to the hydraulic reservoir.

Control manifold proportional flow valve (PV1) is a priority–type flow regulator with pressure compensated bypass flow. Priority hydraulic flow from this valve is to the rear option motors. Based on wireless remote settings, electrical voltage to valve (PV1) is supplied by the base unit. Valve (PV1) includes manual adjustment for machine operation should the wireless controller be lost, damaged or faulty.

NOTE: The schematic symbols for the pressure compensator valve (EC1) and proportional flow valve (PV1) include lines above and below the valve symbols which designate infinite positioning of the valve spools. These valves appear to be two (2) position valves but in operation, the valves will shift to provide necessary flow to both the floor motor and to the rear option motors based on control settings.

Control manifold proportional solenoid valve (SP1) is used to allow flow to the floor motor. Based on wireless remote settings, electrical voltage to valve (SP1) is supplied by the base unit. Solenoid valve (SP1) includes manual adjustment for machine operation should the wireless controller be lost, damaged or faulty.

NOTE: Control manifold solenoid valve SV1 is not used in ProPass 200 machines. This valve is included in the manifold for use on other machines that also use this same manifold.

If neither the floor motor or rear option (twin spinner or conveyor) motors are engaged, none of the hydraulic control manifold solenoid valve coils are energized. Hydraulic flow is prevented through the unshifted solenoid valves causing the pressure compensator valve (EC1) and proportional flow valve (PV1) to shift. These two (2) valves route hydraulic flow back to the hydraulic reservoir, bypassing the floor and rear option motors. The floor and rear option will remain in the stationary positions.

NOTE: Typically, the rear option (twin spinner or conveyor) is engaged before the floor is started.

When the operator engages the floor conveyor, the solenoid coil on solenoid valve (SP1) is energized by an output from the base unit. The shifted SP1 valve directs hydraulic flow to the floor motor. To allow the proper motor speed, the base unit supplies the necessary voltage to the SP1 solenoid coil based on settings of the wireless remote. Flow from the SP1 valve is proportional to current applied to the valve coil by the base unit. System hydraulic flow in excess of the floor valve setting is available for the rear option. Return from the rear option motors is routed to the reservoir.

Check valve CV1 along with orifice fittings ORF1 and ORF2 are included in the floor circuit to ensure that pressure compensator valve (EC1) provides the necessary flow to the floor motor.

Hydraulic circuit pressure is controlled by the system relief valve either on the tow vehicle or hydraulic power pack.

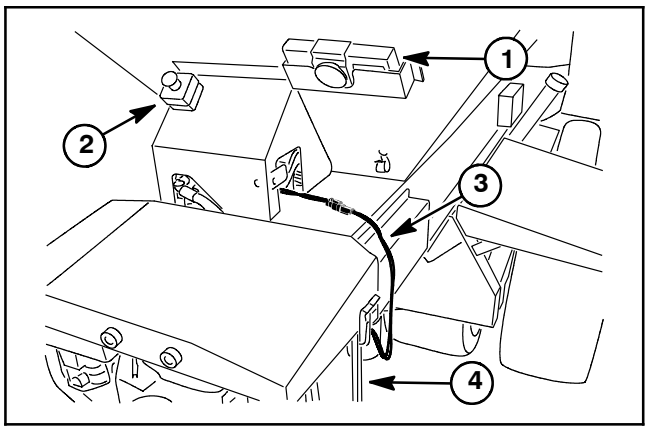


Figure 21

1. **Wireless remote**
2. **E-Stop button**
3. **Power lead harness**
4. **Optional power pack**

Special Tools

Order the following special tools from your Toro Distributor.

Hydraulic Pressure Test Kit

Use to take various pressure readings for diagnostic tests. Quick disconnect fittings provided attach directly to mating fittings on machine test ports without tools. A high pressure hose is provided for remote readings. Contains one each: 1000 PSI (70 Bar), 5000 PSI (350 Bar) and 10000 PSI (700 Bar) gauges.

Toro Part Number: **TOR47009**

Figure 22

Hydraulic Tester (Pressure and Flow)

Use to test hydraulic circuits and components for flow and pressure capacities. This tester includes the following:

1. INLET HOSE: Hose connected from the system circuit to the inlet side of the hydraulic tester.

2. LOAD VALVE: A simulated working load is created in the circuit by turning the valve to restrict flow.

3. PRESSURE GAUGE: Glycerine filled 0 to 5000 PSI gauge to provide operating circuit pressure.

4. FLOW METER: This meter measures actual oil flow in the operating circuit with a gauge rated from 1 to 15 GPM (5 to 55 LPM).

5. OUTLET HOSE: A hose from the outlet side of the hydraulic tester connects to the hydraulic system circuit.

6. FITTINGS: An assortment of hydraulic fittings are included with this kit.

Toro Part Number: **TOR214678**

Figure 23

Hydraulic Test Fitting Kit

This kit includes a variety of O−ring Face Seal fittings to enable you to connect test gauges into the system.

The kit includes: tee's, unions, reducers, plugs, caps and male test fittings.

Toro Part Number: **TOR4079**

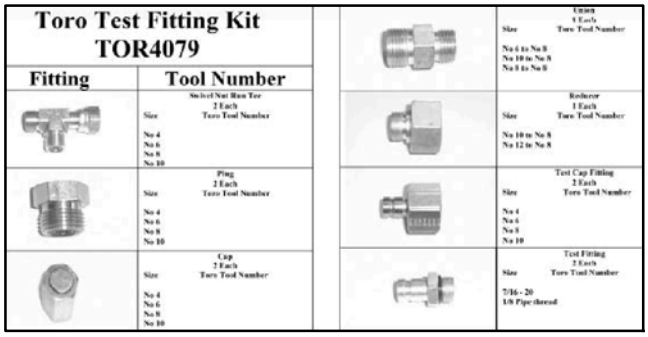


Figure 24

O−ring Kit

This kit includes O−rings in a variety of sizes for face seal and port seal hydraulic connections. It is recommended that O−rings be replaced whenever a hydraulic connection is loosened.

Toro Part Number: **117−2727**

Figure 25

Troubleshooting

For effective troubleshooting and repairs, there must be a good understanding of the hydraulic circuits and components used on this machine (see Hydraulic Schematics in this chapter).

Problem	Possible Causes
No ProPass functions operate.	Hydraulic lines are not connected to tow vehicle (machines that use hydraulic flow from tow vehicle). Hydraulic lines to tow vehicle are not connected correctly (machines that use hydraulic flow from tow vehicle). Hydraulic reservoir level is low. Electrical power to ProPass hydraulic components is not available (e.g. power harness not connected to tow vehicle, tow vehicle key not ON, fuse is faulty, vehicle battery is discharged). Tow vehicle has a hydraulic problem (machines that use hydraulic flow from tow vehicle). Hydraulic power pack relief valve is stuck open or faulty (machines that have hydraulic power pack). Hydraulic power pack gear pump is faulty (machines that have hydraulic power pack). An electrical problem exists (see Chapter 4 – Electrical System).
Rear option does not function (machines with standard hydraulics).	Rear option hydraulic lines are not connected. Rear option control valve setting is not adjusted properly. Rear option solenoid valve is faulty. An electrical problem exists (see Chapter 4 – Electrical System). Rear option hydraulic motor(s) are faulty.
Rear option does not function (machines with electronic hydraulics). NOTE: Check wireless remote LCD display and base unit LED's for help in troubleshooting.	Rear option hydraulic lines are not connected. Wireless remote settings are incorrect. Control manifold proportional flow valve (PV1) is faulty. An electrical problem exists (see Chapter 4 – Electrical System). Rear option hydraulic motor(s) are faulty.

Problem	Possible Causes
Floor does not function (machines with standard hydraulics).	Floor control valve setting is not adjusted properly. Floor solenoid valve is faulty. An electrical problem exists (see Chapter 4 – Electrical System). Hydraulic floor motor is faulty.
Floor does not function (machines with electronic hydraulics). NOTE: Check wireless remote LCD display and base unit LED's for help in troubleshooting.	Wireless remote settings are incorrect. Control manifold proportional solenoid valve (SP1) is faulty. An electrical problem exists (see Chapter 4 – Electrical System). Hydraulic floor motor is faulty.

Testing

The most effective method for isolating problems in the hydraulic system is by using hydraulic test equipment such as pressure gauges and flow meters in the circuits during various operational checks (see the Special Tools section in this chapter).

IMPORTANT: All obvious areas such as oil supply, filter, binding linkages, loose fasteners or improper adjustments must be checked before assuming that a hydraulic component is the source of the problem.

WARNING

Before disconnecting or performing any work on the hydraulic system, all pressure in the system must be relieved and all rotating machine parts must be stopped. See Relieving Hydraulic System Pressure in the General Information section.

CAUTION

Failure to use gauges with recommended pressure (PSI) rating as listed in test procedures could result in damage to the gauge and possible personal injury from leaking hot oil.

CAUTION

All testing should be performed by two (2) people. One person should be in the seat to operate the machine and the other should monitor testing equipment and record test results.

WARNING

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Do not use hands to search for leaks; use paper or cardboard. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and cause serious injury. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result from such an injury.

Precautions for Hydraulic Testing

1. Clean machine thoroughly before disconnecting or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment. Hydraulic system contamination will cause excessive wear of hydraulic components.

2. Put metal caps or plugs on all hydraulic lines left open or exposed during testing or removal of components.

3. The engine must be in good operating condition. Use a phototac to determine engine speed when performing a hydraulic test. Engine speed will affect the accuracy of the tester readings.

4. When using hydraulic tester with pressure and flow capabilities, the inlet and the outlet hoses must be properly connected and not reversed to prevent damage to the hydraulic tester or machine components.

5. When using hydraulic tester with pressure and flow capabilities, open load valve completely in the tester to minimize the possibility of damaging components.

6. Install fittings finger tight and far enough to make sure that they are not cross–threaded before tightening them with a wrench.

7. Position tester hoses to prevent rotating machine parts from contacting and damaging the hoses or tester.

8. Check oil level in the hydraulic reservoir. After connecting test equipment, make sure hydraulic reservoir is full.

9. Check control linkages for improper adjustment, binding or broken parts.

10. All hydraulic tests should be made with the hydraulic oil at normal operating temperature.

11. Before returning machine to use, make sure that hydraulic reservoir has correct fluid level.

ProPass Hydraulic Testing

If your ProPass uses hydraulic flow from a tow vehicle, refer to service information for the tow vehicle to determine testing procedures for flow and relief pressure on your ProPass.

If your ProPass is equipped with the hydraulic power pack, see the Hydraulic Testing section of Chapter 6 – Hydraulic Power Pack for hydraulic testing procedures.

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General Precautions for Removing and Installing Hydraulic System Components

Before Repair or Replacement of Hydraulic Components

1. Before removing any components from the hydraulic system, position ProPass machine on a level surface. Engage tow vehicle parking brake, stop engine and remove key from the ignition switch. If ProPass is equipped with wireless controller, power off wireless controller.

2. Clean machine before disconnecting, removing or disassembling any hydraulic components. Make sure hydraulic components, hoses connections and fittings are cleaned thoroughly. Always keep in mind the need for cleanliness when working on hydraulic equipment.

WARNING

Before disconnecting or performing any work on the hydraulic system, all pressure in the system must be relieved and all rotating machine parts must be stopped. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

3. Put caps or plugs on any hydraulic lines, hydraulic fittings and components left open or exposed to prevent system contamination.

4. Put labels on disconnected hydraulic lines and hoses for proper installation after repairs are completed.

5. Note the position of hydraulic fittings (especially elbow fittings) on hydraulic components before removal. Mark parts if necessary to make sure they will be aligned properly when installing hydraulic hoses and tubes.

After Repair or Replacement of Hydraulic Components

1. Check oil level in the hydraulic reservoir and add correct oil if necessary. Drain and refill hydraulic system reservoir and change oil filter if component failure was severe or system is contaminated.

2. Lubricate O-rings and seals with clean hydraulic oil before installing hydraulic components.

3. Make sure caps or plugs are removed from the hydraulic tubes, hydraulic fittings and components before reconnecting.

4. Use proper tightening methods when installing hydraulic hoses and fittings (see Hydraulic Hose and Tube Installation and Hydraulic Fitting Installation in the General Information section of this chapter).

5. After disconnecting or replacing any hydraulic components, operate machine functions slowly until air is out of hydraulic system.

6. Check for hydraulic oil leaks. Shut off engine and correct leaks if necessary. Check oil level in hydraulic reservoir and add correct oil if necessary.

Check Hydraulic Lines and Hoses

WARNING

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and cause serious injury. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result from such an injury.

IMPORTANT: Check hydraulic lines and hoses daily for leaks, kinked lines, loose mounting supports, wear, loose fittings or deterioration. Make all necessary repairs before operating the machine.

Hydraulic Control (Machines with Standard Hydraulic Controls)

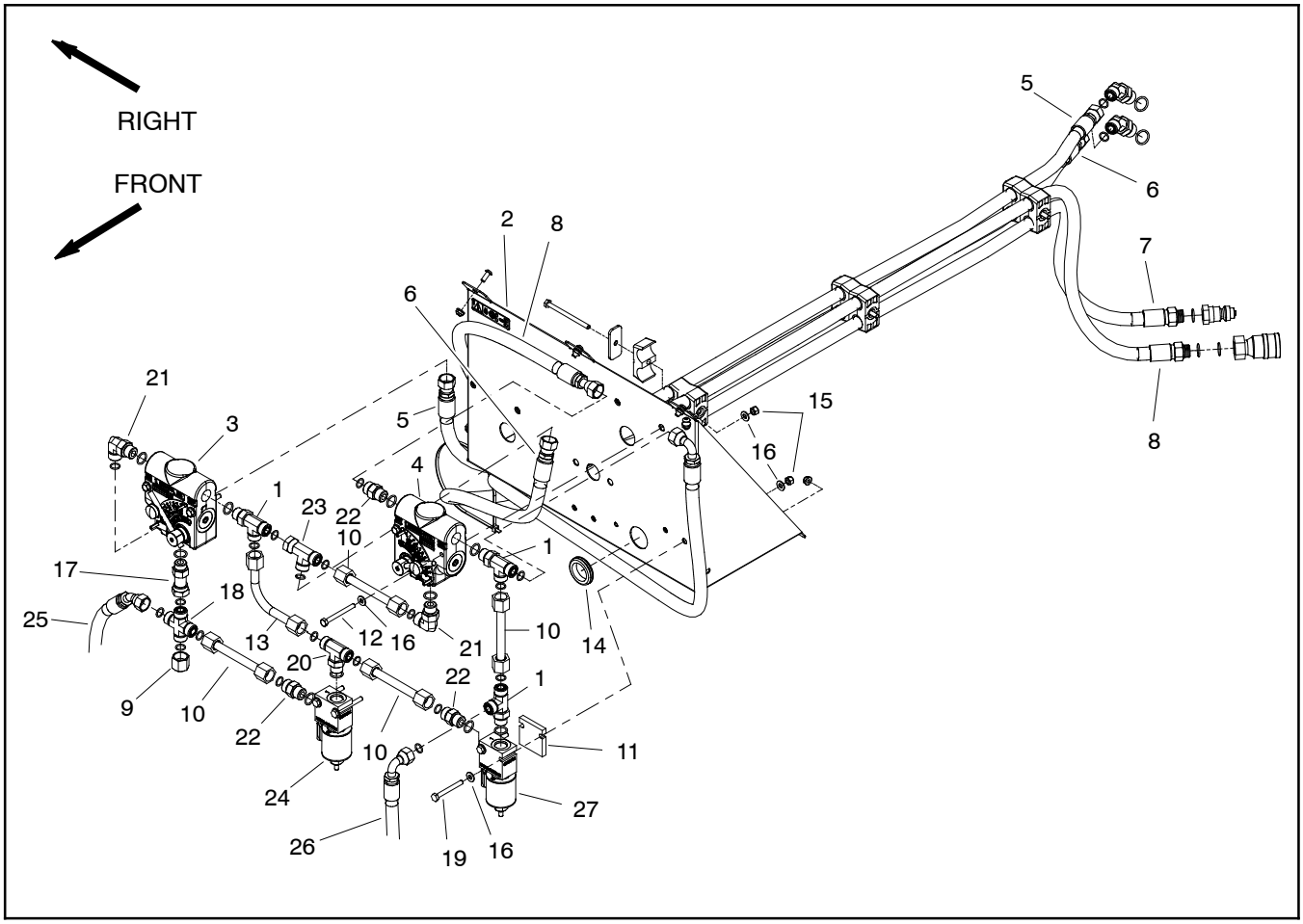

Figure 26

1. Hydraulic tee fitting (3 used)
2. Panel
3. Floor control valve
4. Rear option control valve
5. Hydraulic hose
6. Hydraulic hose
7. Hydraulic hose
8. Hydraulic hose
9. Hydraulic cap
10. Hydraulic tube (4 used)
11. Valve spacer (2 used)
12. Cap screw (4 used)
13. Hydraulic tube
14. Rubber grommet
15. Lock nut
16. Flat washer
17. Hydraulic adapter
18. Hydraulic adapter
19. Cap screw (4 used)
20. Hydraulic tee fitting
21. 90° hydraulic fitting (2 used)
22. Straight hydraulic fitting (3 used)
23. Hydraulic tee fitting
24. Floor solenoid valve
25. Hydraulic supply hose
26. Hydraulic return hose
27. Rear option solenoid valve

Disassembly (Fig. 26)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove hydraulic guard from machine to allow access to hydraulic controls (Fig. 27).

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

3. Relieve hydraulic system pressure.

4. Before removing any control system components, thoroughly clean all hydraulic connections. For assembly purposes, label hydraulic and electrical connections at components that are to be removed.

5. Remove control system components as needed using Figure 26 as a guide. Allow hydraulic oil to drain from disconnected hydraulic lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

Assembly (Fig. 26)

1. Install all removed control system components using Figure 26 as a guide.

   A. If fittings were removed, lubricate and place new O−rings onto fittings. Install and properly tighten fittings into component openings (see Hydraulic Fitting Installation in the General Information section of this chapter).

   B. Lubricate and position new O−rings to fittings. Use labels placed during the removal process to properly install hydraulic lines to fittings (see Hydraulic Hose and Tube Installation in the General Information section of this chapter).

   C. Make sure that wire harness connectors are secured to solenoid coils.

2. Install hydraulic guard to machine (Fig. 27).

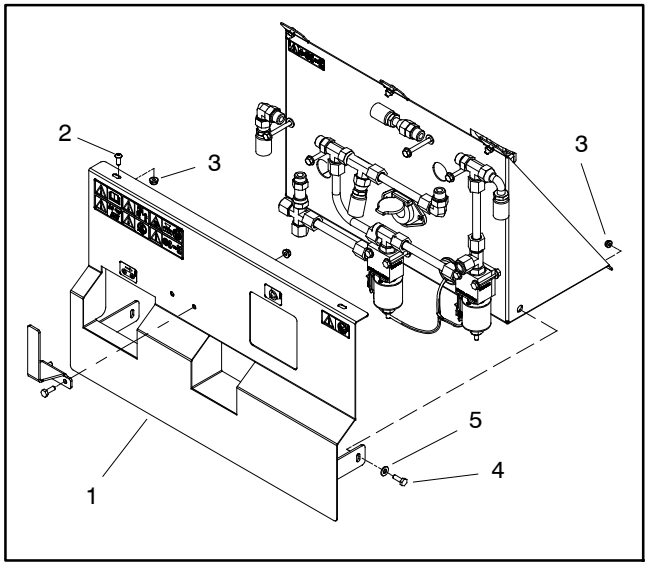

Figure 27

1. **Hydraulic guard**
2. **Screw (2 used)**
3. **Flange nut (4 used)**
4. **Cap screw (2 used)**
5. **Flat washer (2 used)**

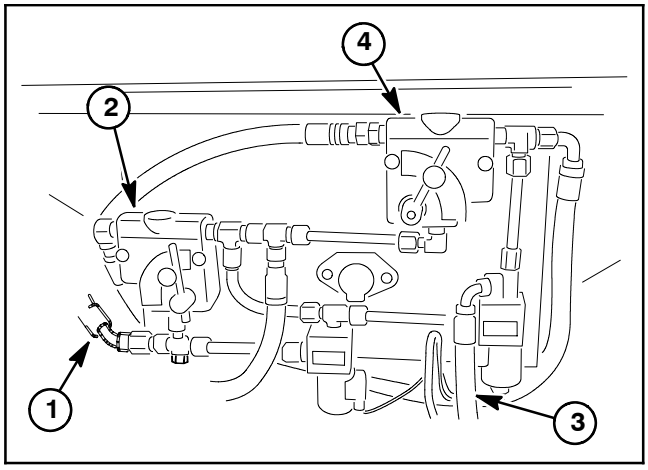

Figure 28

1. **Supply hose (45º)**
2. **Floor control valve**
3. **Return hose (90º)**
4. **Option control valve**

Control Valve Service (Machines with Standard Hydraulic Controls)

ProPass machines with standard hydraulic controls use two (2) control valves for adjusting the speed of the floor and rear option (twin spinner or conveyor) motors. These control valves are located on the front of the hopper (Fig. 29).

NOTE: See Hydraulic Control (Machines with Standard Hydraulic Controls) in this section for information on removing the control valve from the machine.

Disassembly (Fig. 30)

NOTE: A seal kit is available for the control valve. If wear or damage exists to the control valve body, side lever or compensator spool, control valve assembly replacement is necessary.

1. Loosen set screw and slide handle from side lever.

2. Remove retaining rings that secure side lever in the control valve body.

3. Slide seal retainers from side lever.

4. Pull side lever from control valve body. Remove O−rings from side lever.

5. Remove plugs from control valve body. Slide compensator spring and spool from body.

6. Clean control valve components.

7. Inspect side lever, compensator spool and control valve body for wear or damage. Replace control valve assembly if damage exists to these components.

Assembly (Fig. 30)

1. Lubricate new seal kit components with clean hydraulic oil and install new O−rings on side lever and plugs.

2. Dip compensator spool and side lever into clean hydraulic oil.

3. Install plug into the control valve body port opposite the bore for the compensator spool. Then, slide lubricated compensator spool into body. Insert spring and install second plug into control valve body.

4. Slide lubricated side lever into control valve body. Fit seal retainer and retaining ring to both ends of side lever to secure side lever in control valve body.

5. Slide handle into side lever and secure with set screw.

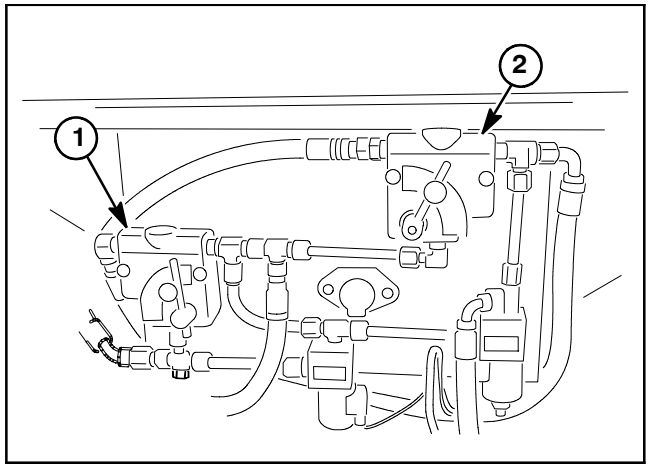

Figure 29

1. **Floor control valve**
2. **Option control valve**

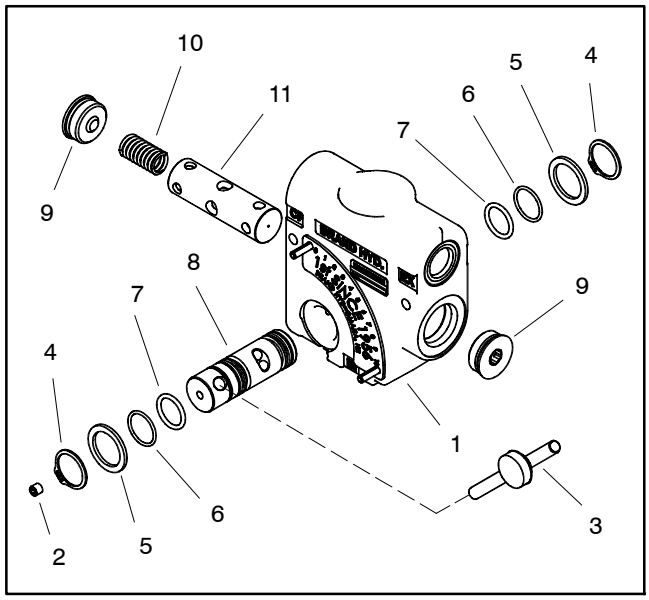

Figure 30

1. **Body**
2. **Set screw**
3. **Handle**
4. **Retaining ring**
5. **Seal retainer**
6. **O−ring**
7. **O−ring**
8. **Side lever**
9. **Plug with O−ring**
10. **Compensator spring**
11. **Compensator spool**

Solenoid Valve Assembly (Machines with Standard Hydraulic Controls)

Two (2) identical solenoid valve assemblies are used on machines with standard hydraulic controls. When energized, these solenoid valves allow hydraulic flow to engage the floor and rear option (twin spinner or conveyor) motors.

NOTE: See Hydraulic Control (Machines with Standard Hydraulic Controls) in this section for information on removing the solenoid valve assembly from the machine.

CAUTION

Before continuing further, read and become familiar with General Precautions for Removing and Installing Hydraulic System Components in this section.

For cartridge valve service procedures, see Hydraulic Control Manifold (Machines with Wireless Control Models) in this section. Refer to Figure 32 for cartridge valve and solenoid coil nut installation torque.

NOTE: See Hydraulic Solenoid Valve Coils in Chapter 4 – Electrical System for information on testing the solenoid coils.

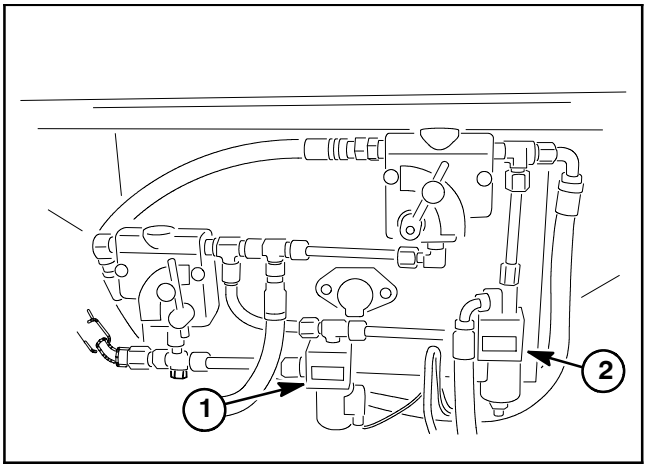

Figure 31

1. **Floor solenoid valve**
2. **Option solenoid valve**

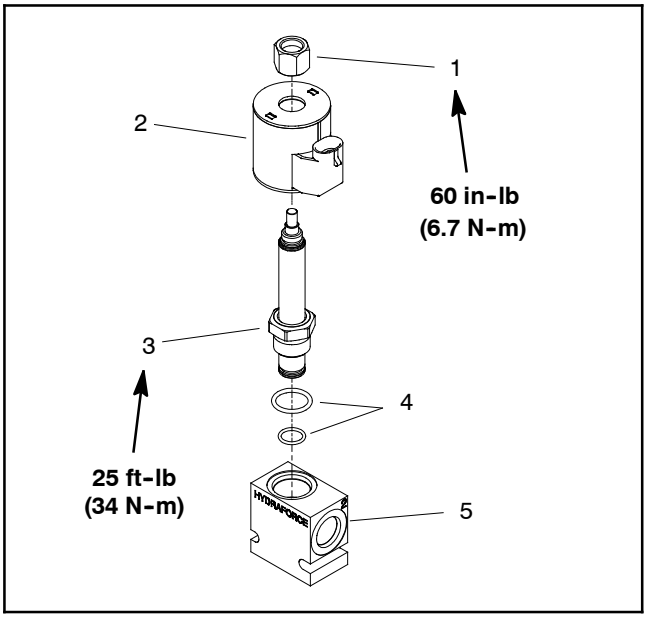

Figure 32

1. **Nut**
2. **Solenoid coil**
3. **Cartridge valve**
4. **Seal kit**
5. **Manifold**

Hydraulic Control (Machines with Electronic Hydraulic Controls)

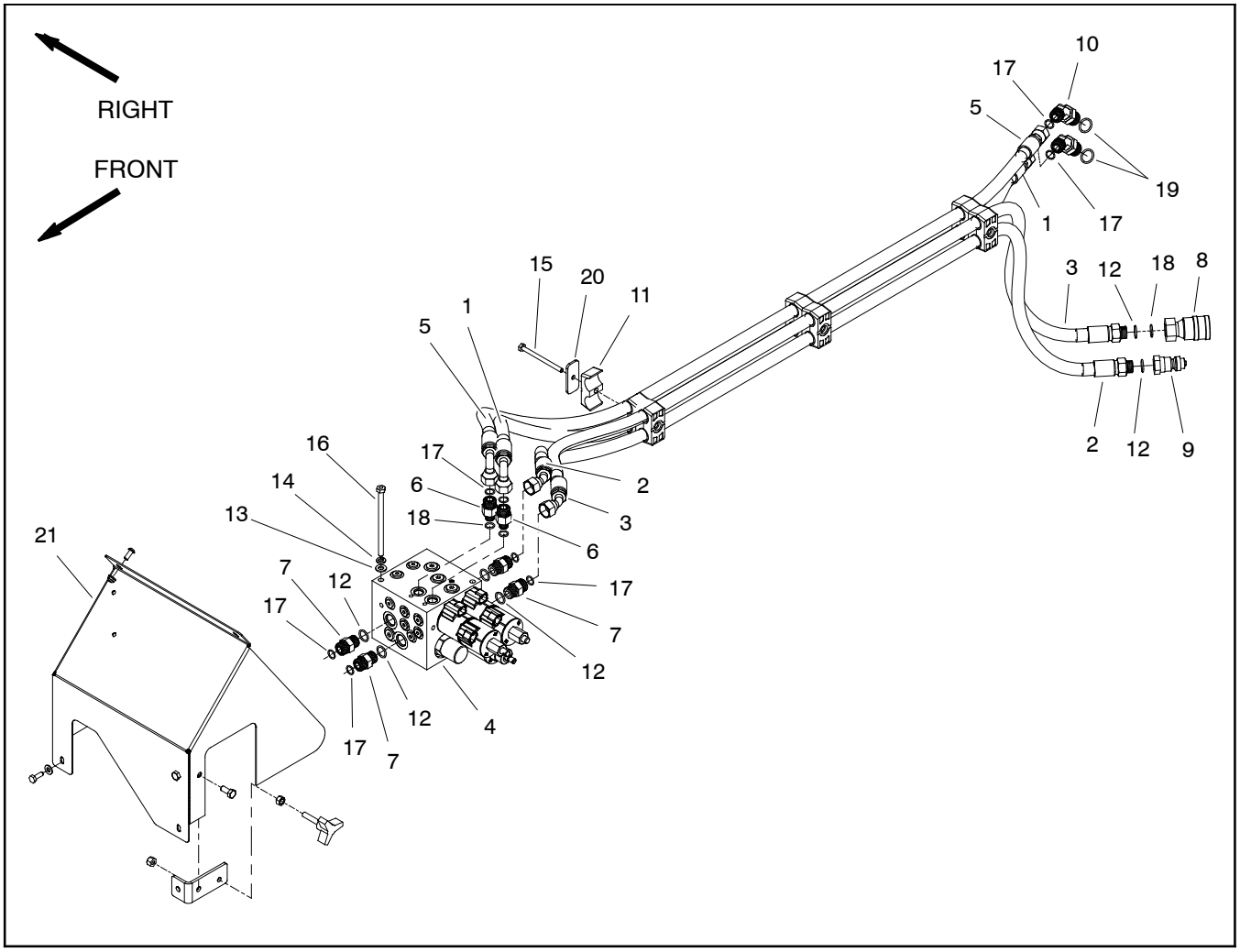

Figure 33

1. Hydraulic hose
2. Hydraulic hose
3. Hydraulic hose
4. Hydraulic control manifold
5. Hydraulic hose
6. Straight hydraulic fitting (2 used)
7. Straight hydraulic fitting (4 used)
8. Female quick disconnect
9. Male quick disconnect
10. 45º hydraulic fitting (2 used)
11. Tube clamp (12 used)
12. O-ring
13. Flat washer (2 used)
14. Lock washer (2 used)
15. Cap screw (3 used)
16. Cap screw (2 used)
17. O-ring
18. Seal kit
19. O-ring
20. Clamp plate (3 used)
21. Control panel guard

Removal (Fig. 33)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Disconnect emergency stop button connector from machine wire harness. Remove control panel guard from front of ProPass to allow access to control manifold.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

3. Relieve hydraulic system pressure.

4. Clean control manifold and all hydraulic connections at manifold. Label all control manifold hydraulic and electrical connections for assembly purposes.

5. Disconnect wire harness connectors from solenoid valves on manifold.

6. Disconnect hydraulic hoses from hydraulic fittings on control manifold. Allow hydraulic oil to drain from lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

7. Remove two (2) cap screws (item 16), lock washers and flat washers that secure manifold to machine frame. Remove control manifold assembly from the machine.

8. If necessary, remove hydraulic fittings and O−rings from manifold. Discard all removed O−rings.

Installation (Fig. 33)

1. If fittings were removed from manifold, lubricate and place new O−rings onto fittings. Install and properly tighten fittings into manifold openings (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. Position manifold assembly to the machine frame. Secure assembly to the frame with two (2) cap screws (item 16), lock washers and flat washers.

3. Remove caps and plugs from disconnected hydraulic lines and manifold fittings.

4. Lubricate and position new O−rings to fittings on manifold. Use labels placed during the removal process to properly install hydraulic lines to manifold fittings (see Hydraulic Hose and Tube Installation in the General Information section of this chapter).

5. Connect wire harness connectors to solenoid valves on manifold.

6. Install control panel guard to front of ProPass. Connect emergency stop button connector to machine wire harness.

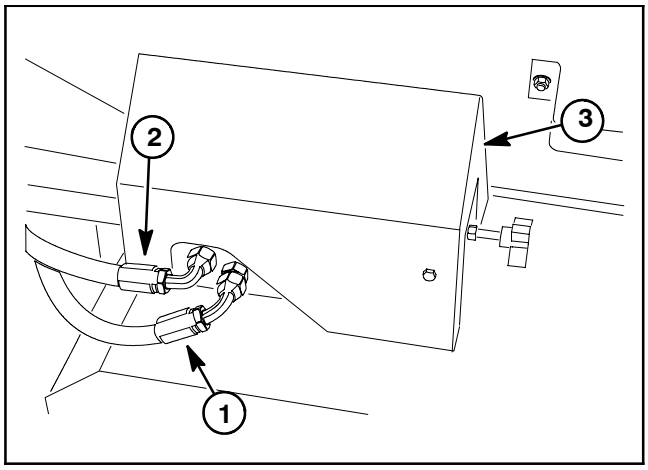

Figure 34

1. **Pressure hose (45º)**
2. **Return hose (90º)**
3. **Control panel guard**

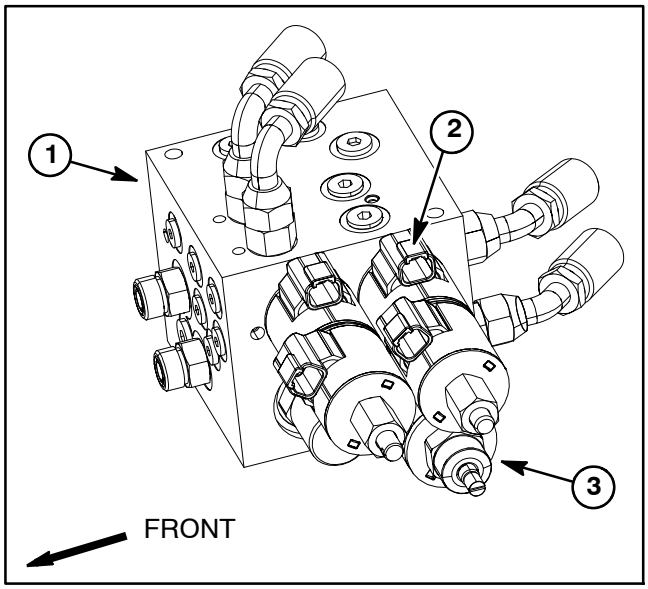

Figure 35

1. **Control manifold**
2. **Solenoid coil: floor**
3. **Solenoid coil: option**

Hydraulic Control Manifold (Machines with Electronic Hydraulic Controls)

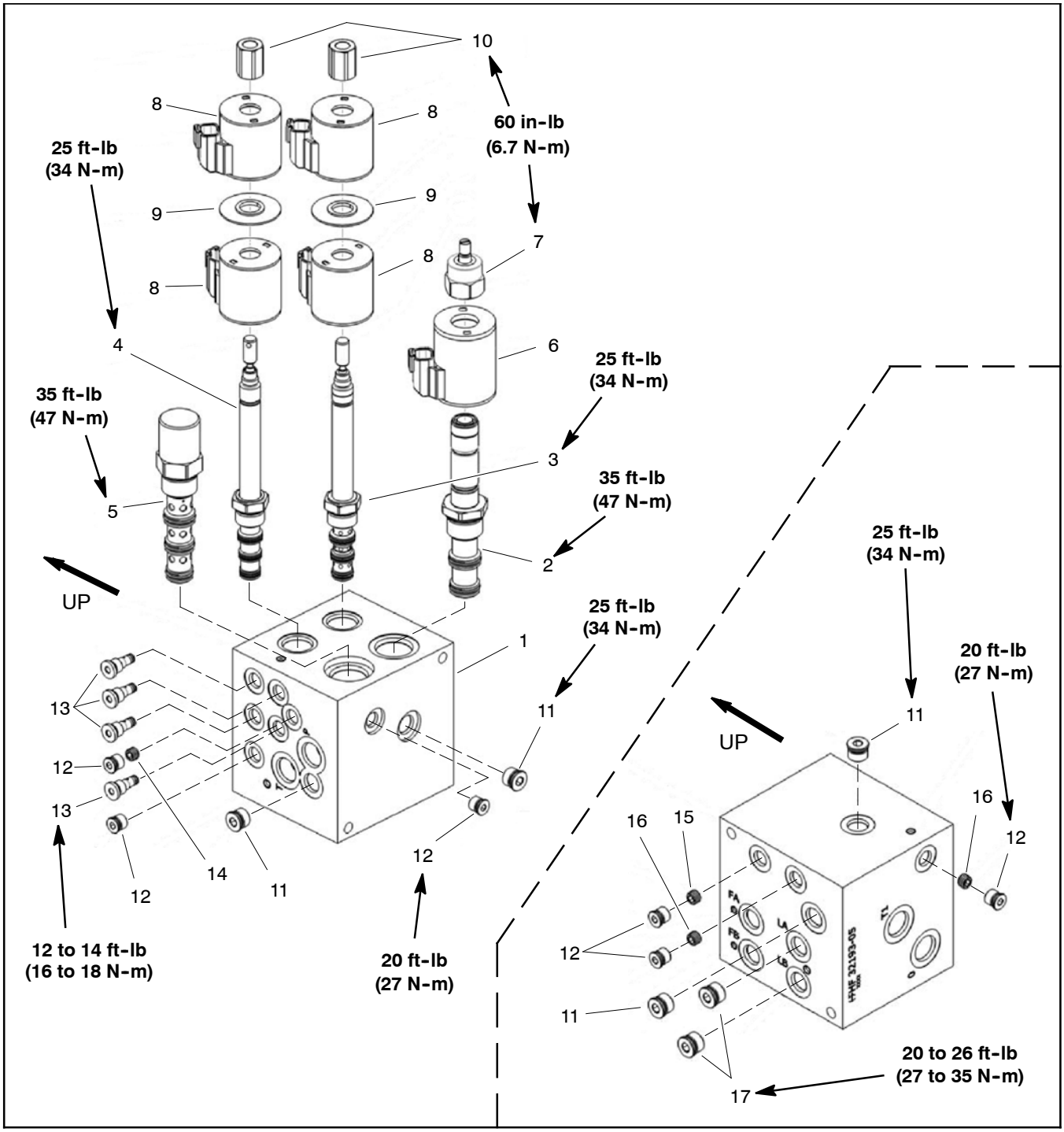

Figure 36

1. Control manifold
2. Proportional flow valve (PV1)
3. Solenoid valve (SV1)
4. Solenoid valve (SP1)
5. Pressure compensator valve (EC1)
6. Solenoid coil
7. Coil nut
8. Solenoid coil (4 used)
9. Coil spacer
10. Coil nut
11. Plug (4 used)
12. #4 plug (6 used)
13. Check valve (4 used)
14. Orifice plug (0.068)
15. Orifice plug (0.040)
16. Orifice plug (0.020) (2 used)
17. #6 plug (2 used)

NOTE: Solenoid valve SV1 and the upper solenoid coil on solenoid valve SP1 are not used in the ProPass 200 hydraulic system.

NOTE: The hydraulic manifold shown in Figure 36 uses several zero leak plugs. These plugs have a tapered sealing surface on the plug head that is designed to resist vibration induced plug loosening. The zero leak plugs also have an O−ring to provide a secondary seal. If zero leak plug removal is necessary, lightly rap the plug head using a punch and hammer before using an allen wrench to remove the plug: the impact will allow plug removal with less chance of damage to the socket head of the plug. When installing plugs into the manifold, torque plugs to the values identified in Figure 36.

NOTE: See Hydraulic Solenoid Valve Coils in Chapter 4 − Electrical System for information on testing the solenoid coils.

CAUTION

Before continuing further, read and become familiar with General Precautions for Removing and Installing Hydraulic System Components in this section.

Cartridge Valve Service

CAUTION

If manifold is connected to machine hydraulic system, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil before removing manifold components. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

1. If control manifold is connected to machine hydraulic system, relieve hydraulic system pressure before servicing the manifold.

2. Make sure control manifold is clean before removing any of the cartridge valves from the control manifold.

3. If cartridge valve is solenoid operated, remove nut securing solenoid coil to the cartridge valve. Carefully slide coil off the valve.

IMPORTANT: Use care when handling the cartridge valve. Slight bending or distortion of the stem tube can cause binding and malfunction. When removing cartridge valve from manifold, make sure that deep well socket fully engages the valve base.

4. Remove cartridge valve from manifold using a deep socket wrench. Note correct location for O−rings, sealing rings and backup rings on valve. Remove seal kit from cartridge valve and discard removed seals.

5. Visually inspect the port in the manifold for damage to the sealing surfaces, damaged threads and contamination.

6. Visually inspect cartridge valve for damaged sealing surfaces and contamination.

A. Contamination may cause valves to stick or hang up. Contamination can become lodged in small valve orifices or seal areas causing malfunction.

B. If valve sealing surfaces appear pitted or damaged, the hydraulic system may be overheating or there may be water in the system.

CAUTION

Use eye protection such as goggles when using compressed air.

7. Clean cartridge valve using clean mineral spirits. Submerge valve in clean mineral spirits to flush out contamination. Particles as fine as talcum powder can affect the operation of high pressure hydraulic valves. If cartridge design allows, use a wood or plastic probe to push the internal spool in and out 20 to 30 times to flush out contamination. Be extremely careful not to damage cartridge. Use compressed air for cleaning.

8. Install the cartridge valve into the manifold:

A. Lubricate new seal kit components with clean hydraulic oil and install on valve. The O−rings, sealing rings and backup rings must be arranged properly on the cartridge valve for proper operation and sealing.

B. Dip assembled cartridge into clean hydraulic oil.

IMPORTANT: Use care when handling the valve cartridge. Slight bending or distortion of the stem tube can cause binding and malfunction. When installing cartridge valve into manifold, make sure that deep well socket fully engages the valve base.

C. Thread cartridge valve carefully into manifold port by hand until the top O−ring is met. The valve should go into manifold port easily without binding.

D. Torque cartridge valve using a deep socket wrench to value identified in Figure 36.

9. If cartridge valve is solenoid operated, carefully install solenoid coil to the cartridge valve. Secure coil to valve with nut and torque nut to **60 in−lb (6.8 N−m)**.

10. If problems still exist after manifold assembly, remove cartridge valve and clean again or replace valve.

Check Valve Service

The ProPass control manifold includes four (4) check valves used for circuit control. Check valve location is identified in Figure 37. Remove check valves from manifold for cleaning or replacement. Replace seal kit on check valves if removed from manifold. Torque check valves from **12 to 14 ft-lb (16 to 18 N-m)** when installing them into manifold.

NOTE: Check valves CV3 and CV4 are not used in the ProPass 200 hydraulic system.

Refer to Hydraulic Schematics in this chapter for circuit location of check valves.

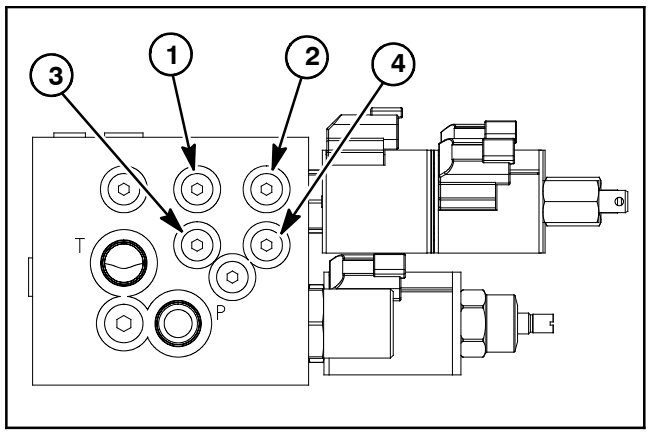

Figure 37

1. **Check valve CV1**
2. **Check valve CV2**
3. **Check valve CV3**
4. **Check valve CV4**

Orifice Service

The control manifold includes four (4) orifice fittings that thread into specific manifold ports. Access to these orifice plugs requires removal of the manifold plug. Orifice locations are shown in Figure 38.

NOTE: Orifice fitting ORF3 is not used in the ProPass 200 hydraulic system.

Refer to Hydraulic Schematics in this chapter for circuit location of the orifice fittings.

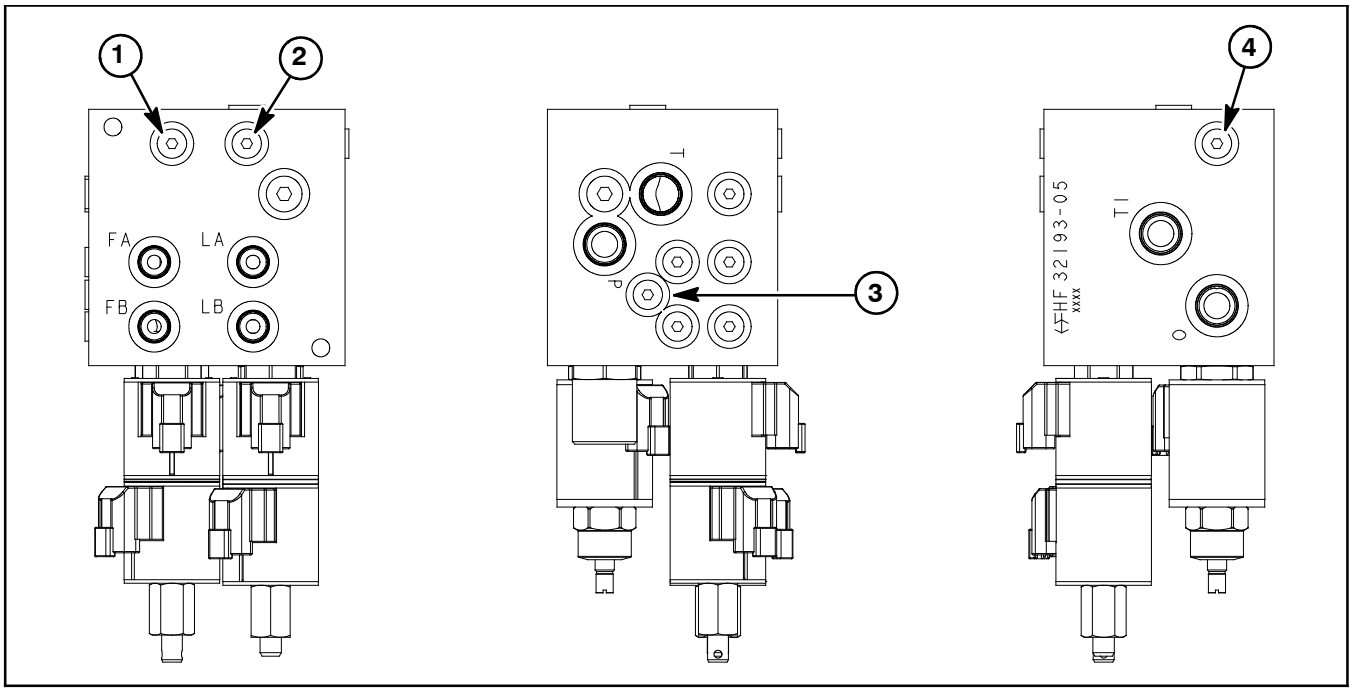

Figure 38

1. **Orifice ORF1 (0.040)**
2. **Orifice ORF2 (0.020)**
3. **Orifice ORF3 (0.068)**
4. **Orifice ORF4 (0.020)**

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Floor Motor

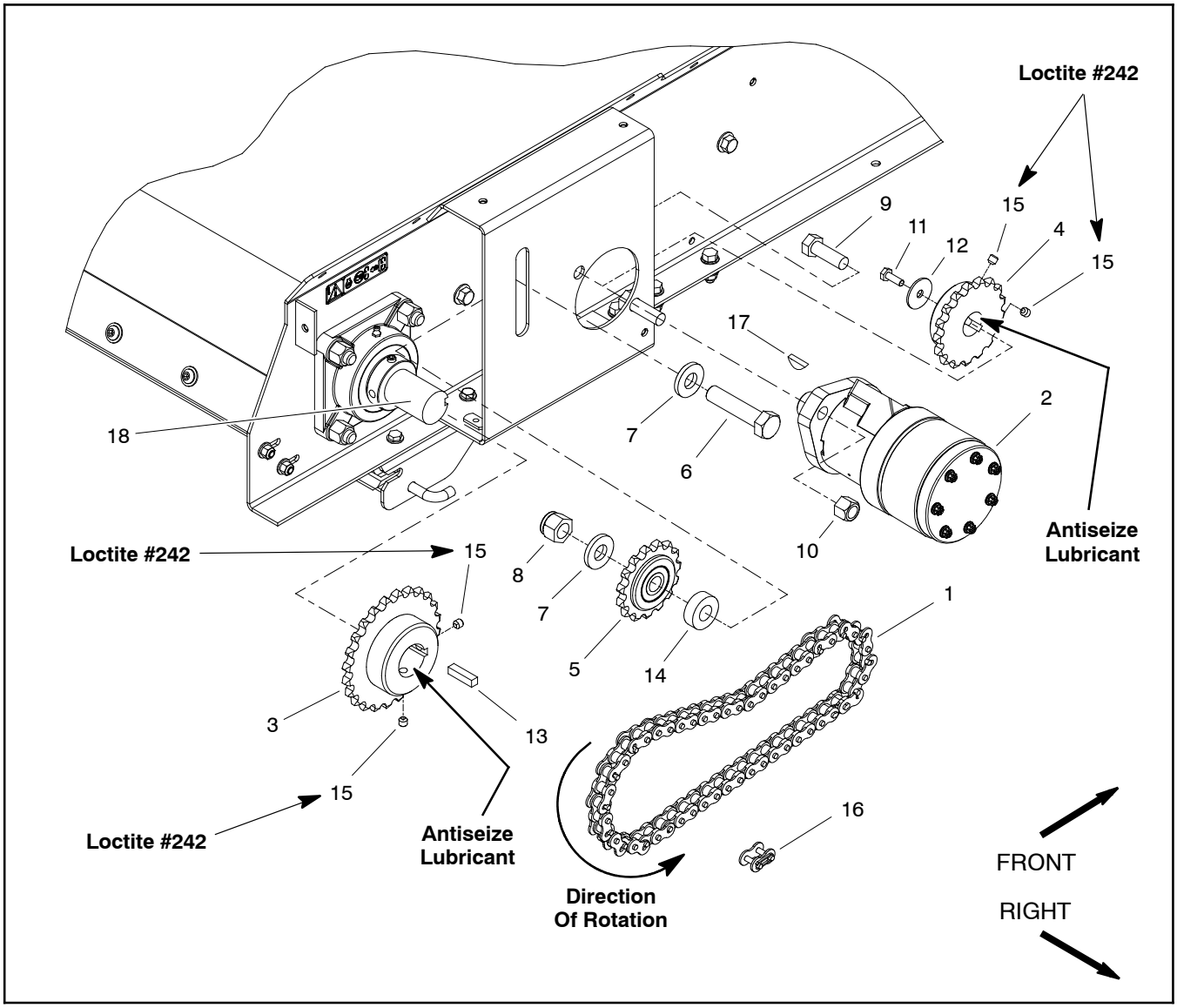

Figure 39

1. Drive chain
2. Hydraulic floor motor
3. Sprocket
4. Sprocket
5. Idler sprocket
6. Cap screw
7. Flat washer (2 used)
8. Lock nut
9. Cap screw (2 used)
10. Lock nut (2 used)
11. Cap screw
12. Flat washer
13. Square key
14. Spacer
15. Set screw (2 used per sprocket)
16. Master link
17. Woodruff key
18. Drive roller shaft

Removal (Fig. 39)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove guards from frame to allow access to floor motor (see Bed Guards in the Service and Repairs section of Chapter 5 – Chassis).

3. Loosen cap screw and lock nut that secure idler sprocket to frame. Move idler sprocket to remove tension from drive chain.

4. Locate and remove master link (item 16) from drive chain. Note direction of master link clip for assembly purposes. Remove drive chain.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

5. Relieve hydraulic system pressure.

6. Clean floor motor and all hydraulic connections at motor. Label hydraulic lines for assembly purposes.

7. Disconnect hydraulic hoses from hydraulic fittings on floor motor. Allow hydraulic oil to drain from lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

8. Remove cap screw (item 11) and flat washer (item 12) that secure sprocket (item 4) to floor motor shaft.

9. Loosen two (2) set screws (item 15) that secure sprocket to floor motor shaft. Slide sprocket from shaft. Locate and retrieve woodruff key (item 17) from motor shaft.

10. Support floor motor to prevent it from falling.

11. Remove two (2) cap screws (item 9) and lock nuts (item 10) that secure floor motor to frame. Remove floor motor from machine.

12. If hydraulic fittings are to be removed from floor motor, mark fitting orientation to allow correct assembly. Remove fittings from motor and discard O-rings.

Installation (Fig. 39)

1. If fittings were removed from floor motor, lubricate and place new O-rings onto fittings. Install fittings into port openings using marks made during the removal process to properly orientate fittings. Tighten fittings (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. Position floor motor to frame and secure with two (2) cap screws (item 9) and lock nut (item 10).

3. Apply antiseize lubricant to floor motor shaft.

4. Position woodruff key to slot in floor motor shaft and then slide sprocket (item 4) onto shaft.

5. Install cap screw (item 11) and flat washer (item 12) into end of floor motor shaft.

6. Slide sprocket to end of motor shaft so that it contacts flat washer.

7. Apply Loctite #242 (or equivalent) to threads of set screws (item 15). Install and tighten set screws to secure sprocket to motor shaft.

8. Remove all caps or plugs that were placed on hydraulic hoses and fittings during disassembly.

9. Using labels placed during motor removal, correctly install and tighten hydraulic hoses to hydraulic fittings on floor motor (see Hydraulic Hose and Tube Installation in the General Information section of this chapter).

10. Fit drive chain onto floor motor, drive roller shaft and idler sprockets. Install master link (item 16) to drive chain and secure ends with master link clip. Make sure that the closed end of the master link clip is facing the direction of chain rotation.

NOTE: Direction of normal roller rotation is shown in Figure 40 as viewed from right side of conveyor.

11. Check that chain is aligned to sprockets. If alignment adjustment is necessary, move sprocket on roller drive shaft as needed.

12. Move idler sprocket to tension the drive chain. Secure idler sprocket by tightening cap screw and lock nut. A properly adjusted chain should allow for free rotation of drive components.

13. Secure guards to frame (see Bed Guards in the Service and Repairs section of Chapter 5 - Chassis).

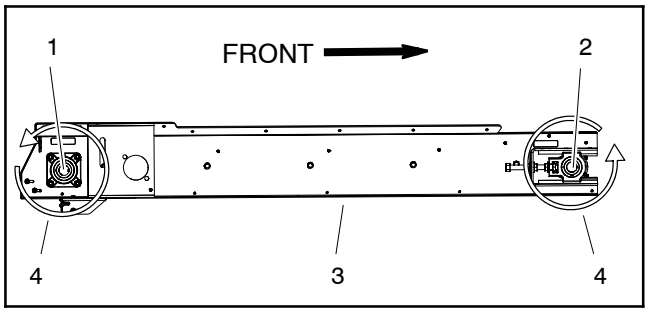

Figure 40

1. **Drive roller**
2. **Idler roller**
3. **RH conveyor frame**
4. **Rotation direction**

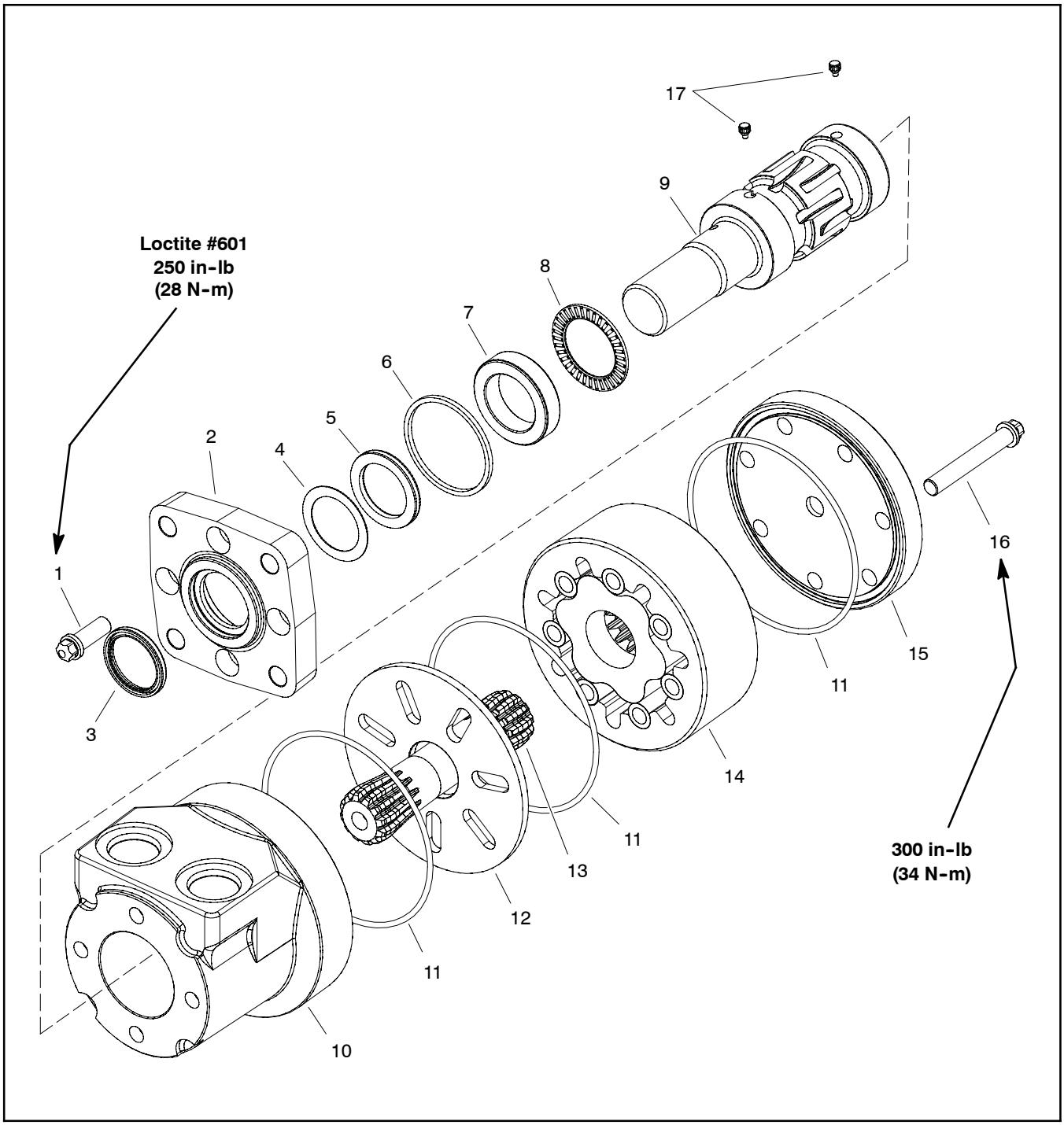

Figure 41

1. Cap screw (4 used)
2. Mounting flange
3. Exclusion seal
4. Back-up ring
5. Pressure seal
6. Seal
7. Bearing race
8. Thrust bearing
9. Output shaft
10. Housing
11. Seal (3 used)
12. Spacer plate
13. Drive
14. Geroler assembly
15. End cap
16. Cap screw (7 used)
17. Poppet (2 used)

NOTE: For service of the conveyor motor, see the Eaton (Char-Lynn) S-Series General Purpose Motors Parts and Repair Manual at the end of this chapter.

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Twin Spinner Motors

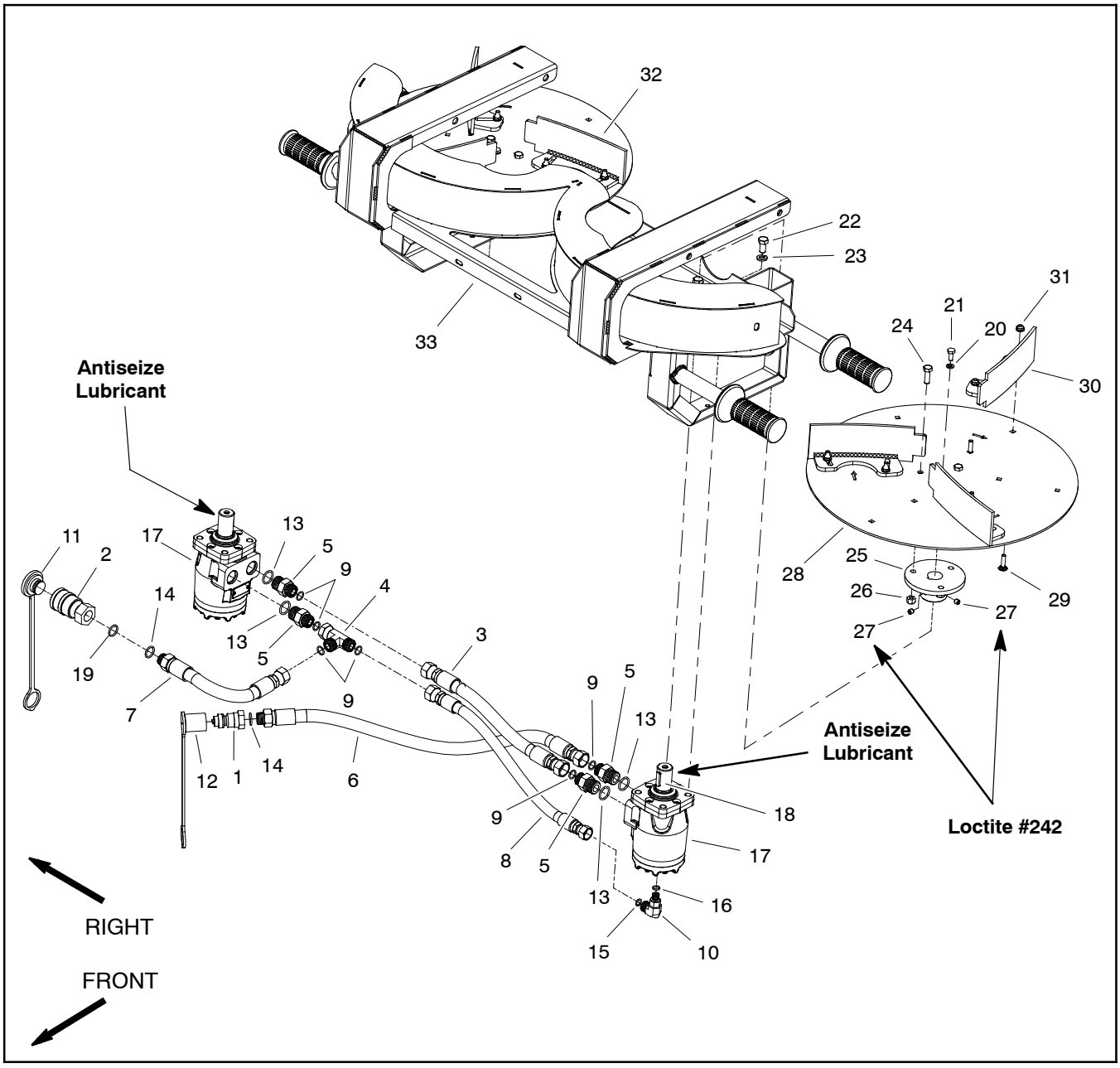

Figure 42

1. Quick disconnect (male)
2. Quick disconnect (female)
3. Hydraulic hose
4. Hydraulic tee fitting
5. Straight hydraulic fitting (4 used)
6. Hydraulic hose
7. Hydraulic hose
8. Hydraulic hose
9. O-ring
10. 90° hydraulic fitting
11. Plug
12. Cap
13. O-ring
14. O-ring
15. O-ring
16. O-ring
17. Spinner motor (2 used)
18. Woodruff key (1 used per motor)
19. Disconnect seal kit
20. Lock washer (1 used per motor)
21. Cap screw (1 used per motor)
22. Cap screw (4 used per motor)
23. Lock washer (4 used per motor)
24. Cap screw (3 used per hub)
25. Hub (2 used)
26. Lock nut (3 used per hub)
27. Set screw (2 used per hub)
28. Spinner disk (2 used)
29. Carriage bolt (2 used per paddle)
30. Left curved paddle (3 used)
31. Flange nut (2 used per paddle)
32. Right curved paddle (3 used)
33. Spinner frame

Removal (Fig. 42)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

2. Relieve hydraulic system pressure.

3. Clean spinner motor and all hydraulic connections at motor. Label hydraulic lines for assembly purposes.

4. Disconnect hydraulic hoses from hydraulic fittings on spinner motor. Allow hydraulic oil to drain from lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

5. Remove spinner assembly. Removal of the spinner will allow access to screws used to secure spinner motor to spinner frame.

   A. Remove cap screw (item 21) and lock washer (item 22) that secure spinner disk and hub to spinner motor shaft.

   B. Remove three (3) cap screws (item 24) and lock nuts (item 26) that secure spinner disk to hub.

   C. Remove spinner assembly from spinner frame.

6. Loosen two (2) set screws (item 27) that secure hub (item 25) to spinner motor shaft. Remove hub from motor shaft. Locate and retrieve woodruff key from motor shaft.

7. Support spinner motor to prevent it from falling.

8. Remove four (4) cap screws (item 22) and lock washers (item 23) that secure spinner motor to spinner frame. Lower motor from spinner frame and remove from machine.

9. If necessary, remove hydraulic fittings from spinner motor. Remove and discard O−rings from fittings.

NOTE: For spinner motor service information, use same procedure as described in Rear Option Motor Service in this section.

Installation (Fig. 42)

1. If removed, install hydraulic fittings with new O−rings into the spinner motor ports (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. Position spinner motor to spinner frame and secure with four (4) cap screws (item 22) and lock washers (item 23).

3. Apply antiseize lubricant to spinner motor shaft.

4. Position woodruff key to slot in spinner motor shaft and then slide hub (item 25) onto shaft.

5. Position spinner assembly into spinner frame and align mounting holes in spinner with hub on motor shaft.

6. Secure spinner assembly to hub with three (3) cap screws (item 24) and lock nuts (item 26).

7. Secure spinner disk to spinner motor shaft with cap screw (item 21) and lock washer (item 22).

8. Apply Loctite #242 (or equivalent) to threads of set screws (item 27). Install and tighten set screws to secure hub to motor shaft.

9. Remove all caps or plugs that were placed on hydraulic hoses and fittings during disassembly.

10. Using labels placed during motor removal, correctly install hydraulic hoses to hydraulic fittings on spinner motor. Tighten connections (see Hydraulic Hose and Tube Installation in the General Information section of this chapter).

Conveyor Motor

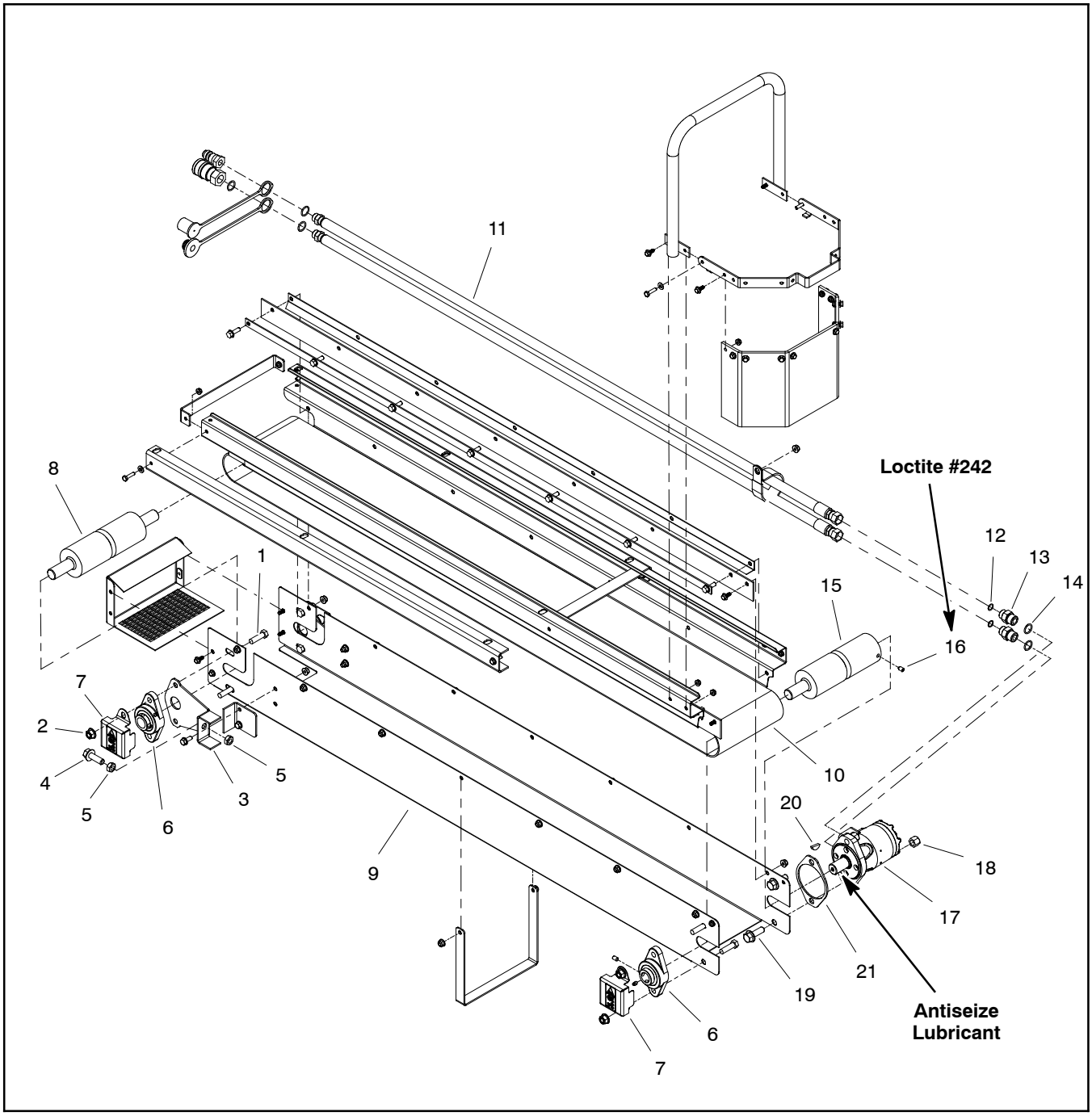

Figure 43

1. Cap screw (2 used per bearing)
2. Flange nut (2 used per bearing)
3. Adjuster plate (2 used)
4. Flange head screw (2 used)
5. Jam nut (4 used)
6. Flange bearing (3 used)
7. Bearing guard (3 used)
8. Idler roller
9. Conveyor cover
10. Conveyor belt
11. Hydraulic hose (2 used)
12. O-ring
13. Hydraulic straight fitting (2 used)
14. O-ring
15. Drive roller
16. Set screw
17. Conveyor motor
18. Lock nut (2 used)
19. Flange nut (2 used)
20. Woodruff key
21. Motor spacer plate

Removal (Fig. 43)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Loosen conveyor belt tension:

   A. Loosen cap screws (item 1) and flange nuts (item 2) that secure adjuster plates (item 3) and flange bearings (item 6) to conveyor cover.

   B. Loosen jam nuts (item 5) and flange head screws (item 4) that adjust location of adjuster plates which will loosen conveyor belt tension.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of this chapter.

3. Relieve hydraulic system pressure.

4. Clean conveyor motor and all hydraulic connections at motor. Label hydraulic lines for assembly purposes.

5. Disconnect hydraulic hoses from hydraulic fittings on conveyor motor. Allow hydraulic oil to drain from lines into a suitable container. Put caps or plugs on open hydraulic lines and fittings to prevent contamination.

6. Support drive roller (item 15) to prevent it from shifting.

7. Loosen set screw (item 16) that secures drive roller to conveyor motor shaft.

8. Remove two (2) flange head screws (item 19) and lock nuts (item 18) that secure conveyor motor shaft to conveyor cover.

9. Slide conveyor motor from drive roller and remove motor and motor spacer (item 21) from machine. Locate and retrieve woodruff key (item 20) from motor shaft.

10. If necessary, remove hydraulic fittings from conveyor motor. Remove and discard O−rings from fittings.

NOTE: For conveyor motor service information, see Rear Option Motor Service in this section.

Installation (Fig. 43)

1. If removed, install hydraulic fittings with new O−rings into the conveyor motor ports (see Hydraulic Fitting Installation in the General Information section of this chapter).

2. Apply antiseize lubricant to conveyor motor shaft.

3. Place woodruff key (item 20) to slot in conveyor motor shaft. Position motor spacer (item 21) to motor flange and then slide motor shaft into drive roller.

4. Align motor mounting holes with conveyor cover and secure motor with two (2) flange head screws (item 19) and lock nuts (item 18).

5. Apply Loctite #242 (or equivalent) to threads of set screw (item 16). Tighten set screw to secure drive drum to motor shaft.

6. Remove all caps or plugs that were placed on hydraulic hoses and fittings during disassembly.

7. Using labels placed during motor removal, correctly install hydraulic hoses to hydraulic fittings on conveyor motor. Tighten connections (see Hydraulic Hose and Tube Installation in the General Information section of this chapter).

8. Adjust conveyor belt (refer to conveyor belt tensioning procedure in ProPass 200 Operator's Manual).

Rear Option Motor Service

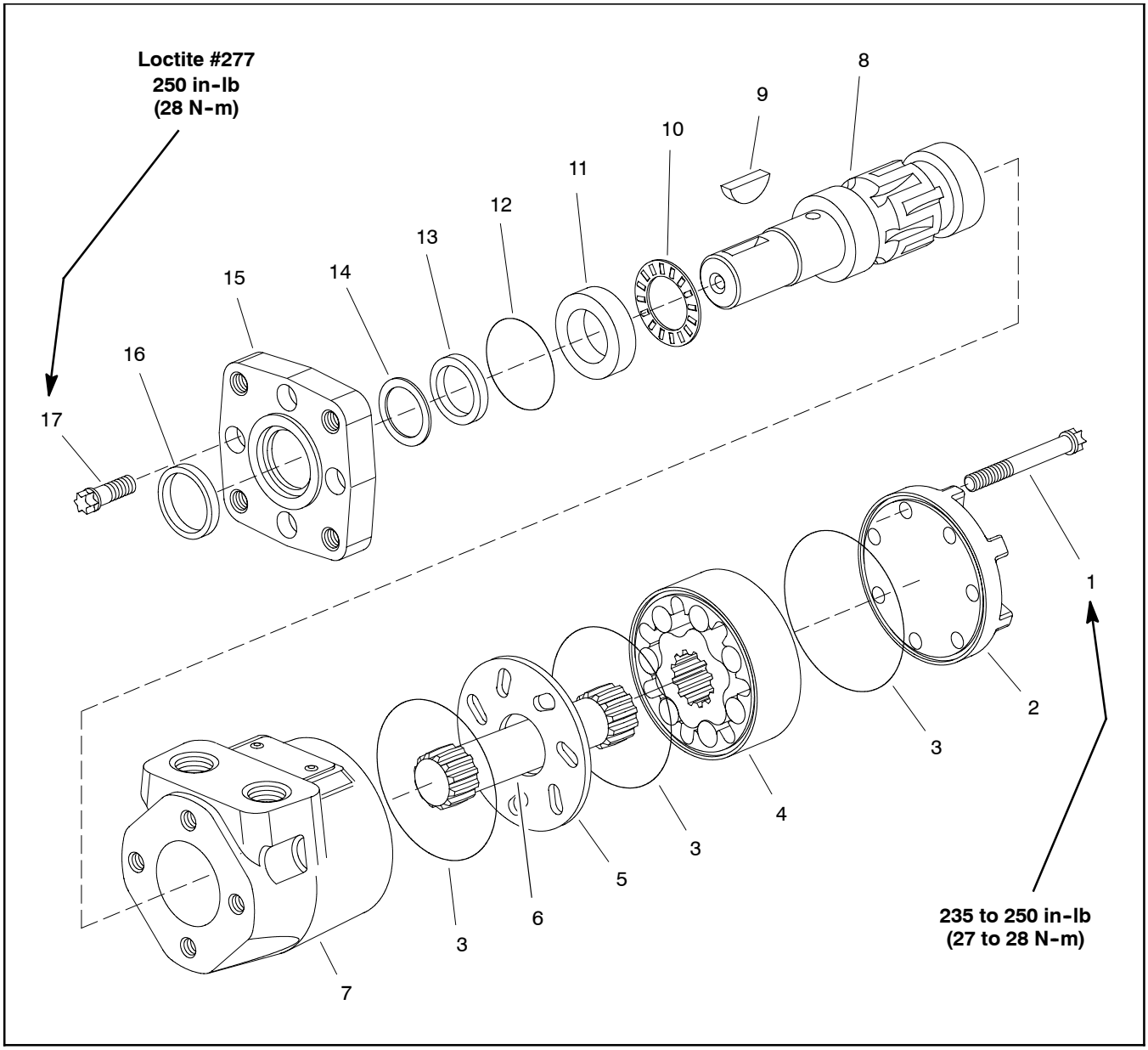

Figure 44

1. Cap screw (7 used)
2. End cap
3. Seal (3 used)
4. Geroler assembly
5. Spacer plate
6. Drive
7. Housing
8. Output shaft
9. Woodruff key
10. Thrust bearing
11. Bearing race
12. Seal
13. Pressure seal
14. Backup ring
15. Mounting flange
16. Exclusion seal
17. Cap screw (4 used)

The hydraulic motor used for the ProPass rear option (twin spinner or conveyor) is the same basic motor regardless of which option exists. The left side spinner motor has a hydraulic case drain hose attached to a 90º fitting installed in the end cap. The right side spinner motor and conveyor motor do not use a case drain hose so the end cap includes a plug.

NOTE: For service of a twin spinner or conveyor motor, see the Eaton (Char-Lynn) R-Series General Purpose Geroler Motor Repair Information at the end of this chapter.

Chapter 4

Electrical System

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General Information

Operator's Manual

The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your ProPass machine. Refer to the Operator's Manual for additional information when servicing the machine.

Machine Hydraulic Control

ProPass 200 machines use either standard hydraulic controls or electronic hydraulic controls to allow the operator to change machine settings.

Machines with standard hydraulic controls include manual hydraulic controls on the front of the ProPass hopper to adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 1). A pendant electrical control allows the operator to energize the floor and rear option from the operator position of the tow vehicle.

Machines with electronic hydraulic controls include a wireless remote to electrically adjust hydraulic flow to the floor and rear option (twin spinner or conveyor) motors (Fig. 2). The remote allows initial adjustment of the floor and spinner motors as well as making adjustments possible while the machine is operating. An E-Stop button on the machine disables the electrical system to prevent unexpected machine operation.

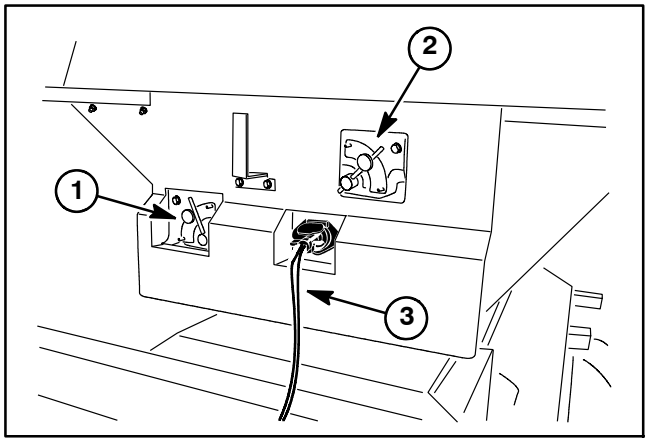

Figure 1

1. **Floor control**
2. **Rear option control**
3. **Pendant harness**

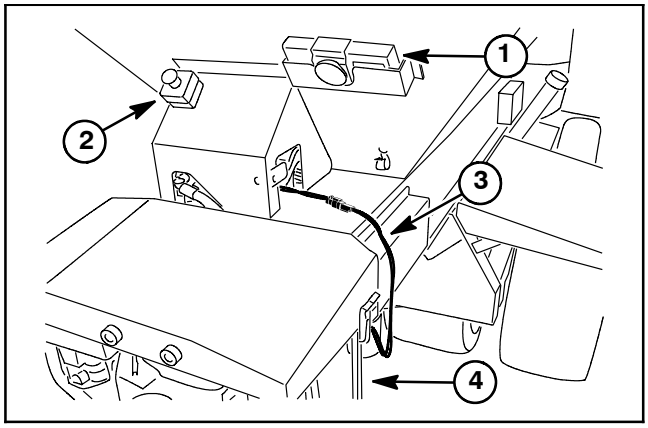

Figure 2

1. **Wireless remote**
2. **E-Stop button**
3. **Power lead harness**
4. **Optional power pack**

Electrical Schematics

Machines with Standard Hydraulic Controls

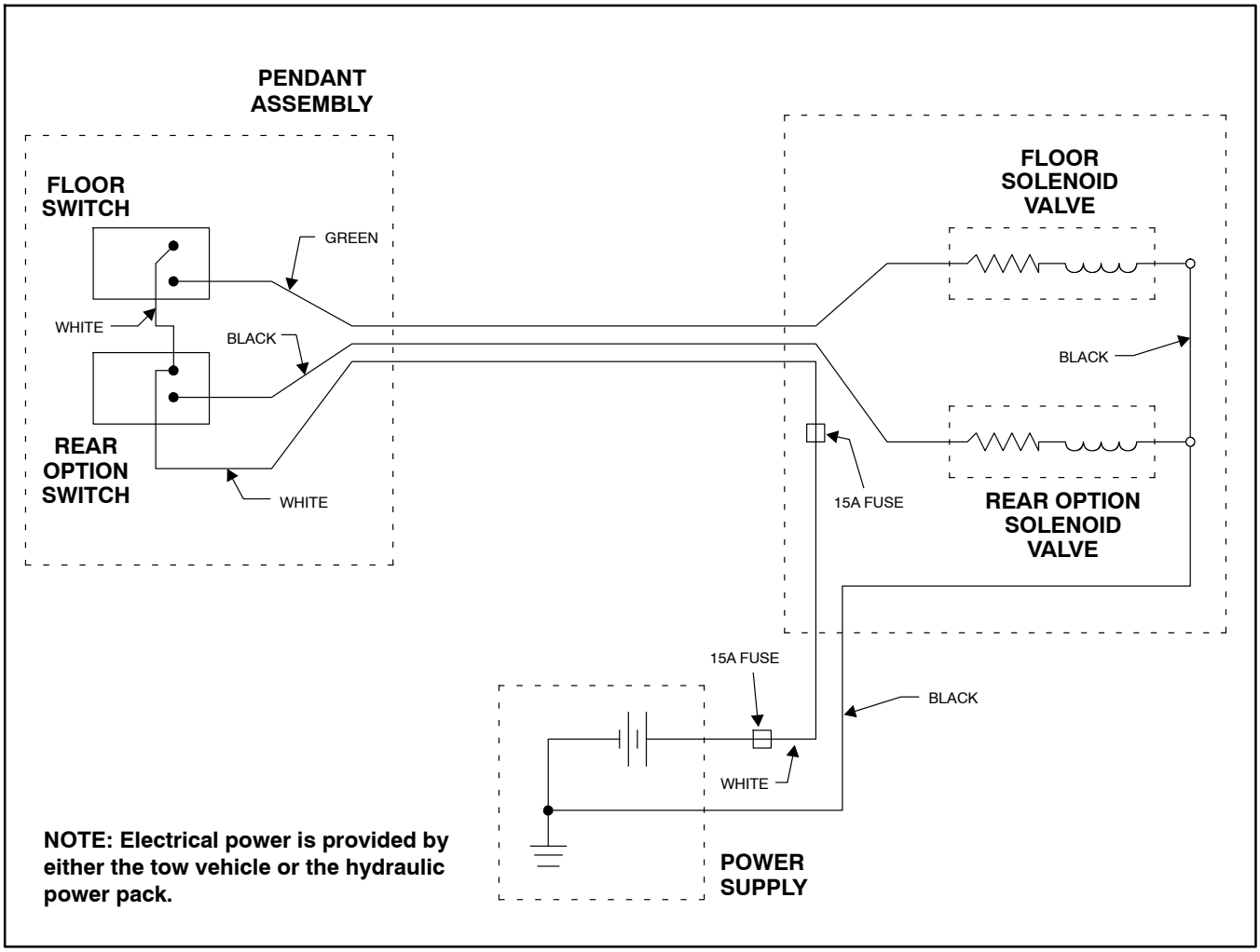

Figure 3

Machines with Electronic Hydraulic Controls

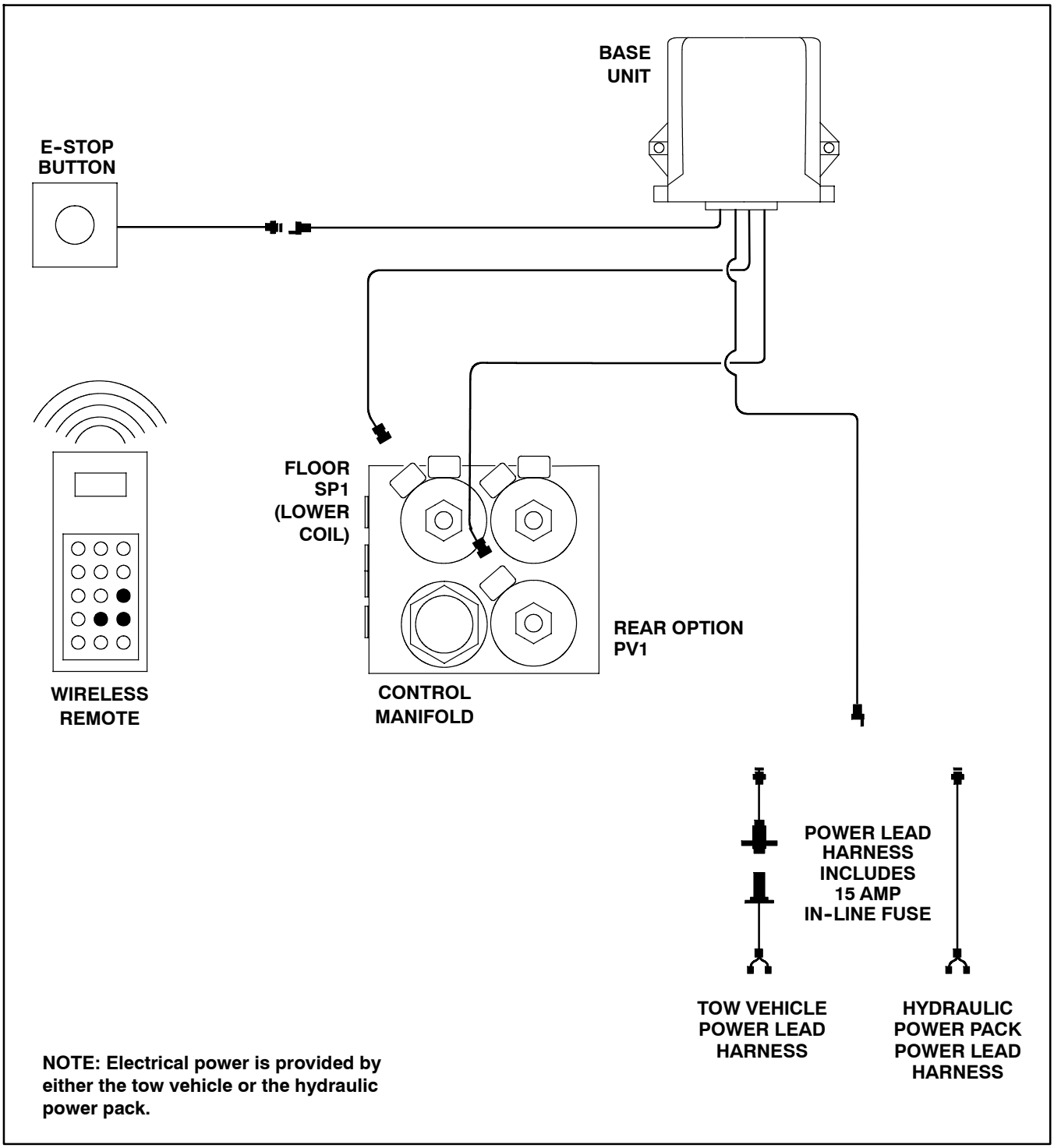
BASE UNIT
E-STOP BUTTON
FLOOR SP1 (LOWER COIL)
REAR OPTION PV1
WIRELESS REMOTE
CONTROL MANIFOLD
POWER LEAD HARNESS INCLUDES 15 AMP IN-LINE FUSE
TOW VEHICLE POWER LEAD HARNESS
HYDRAULIC POWER PACK POWER LEAD HARNESS
NOTE: Electrical power is provided by either the tow vehicle or the hydraulic power pack.

Figure 4

Wire Harness Drawings

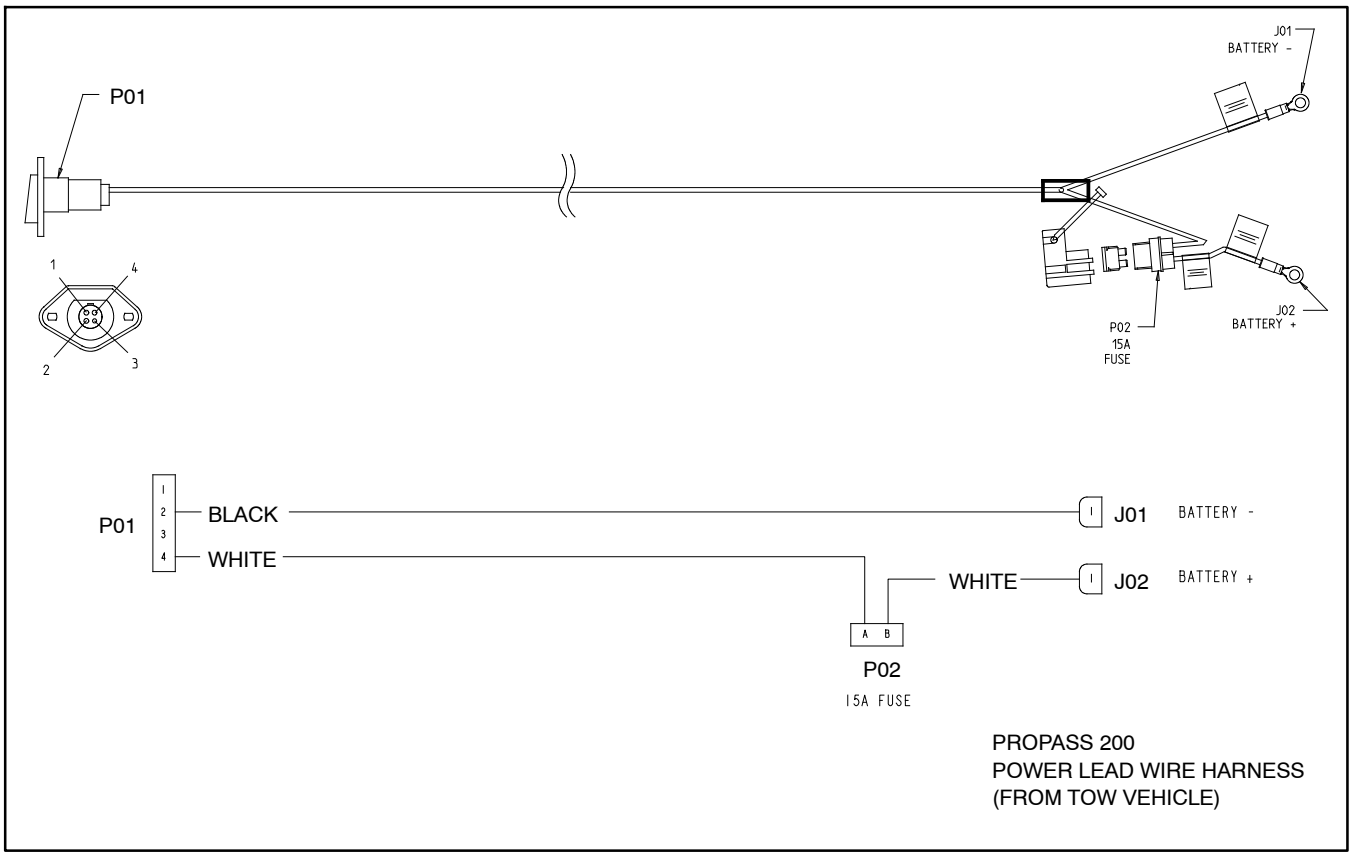

Figure 5

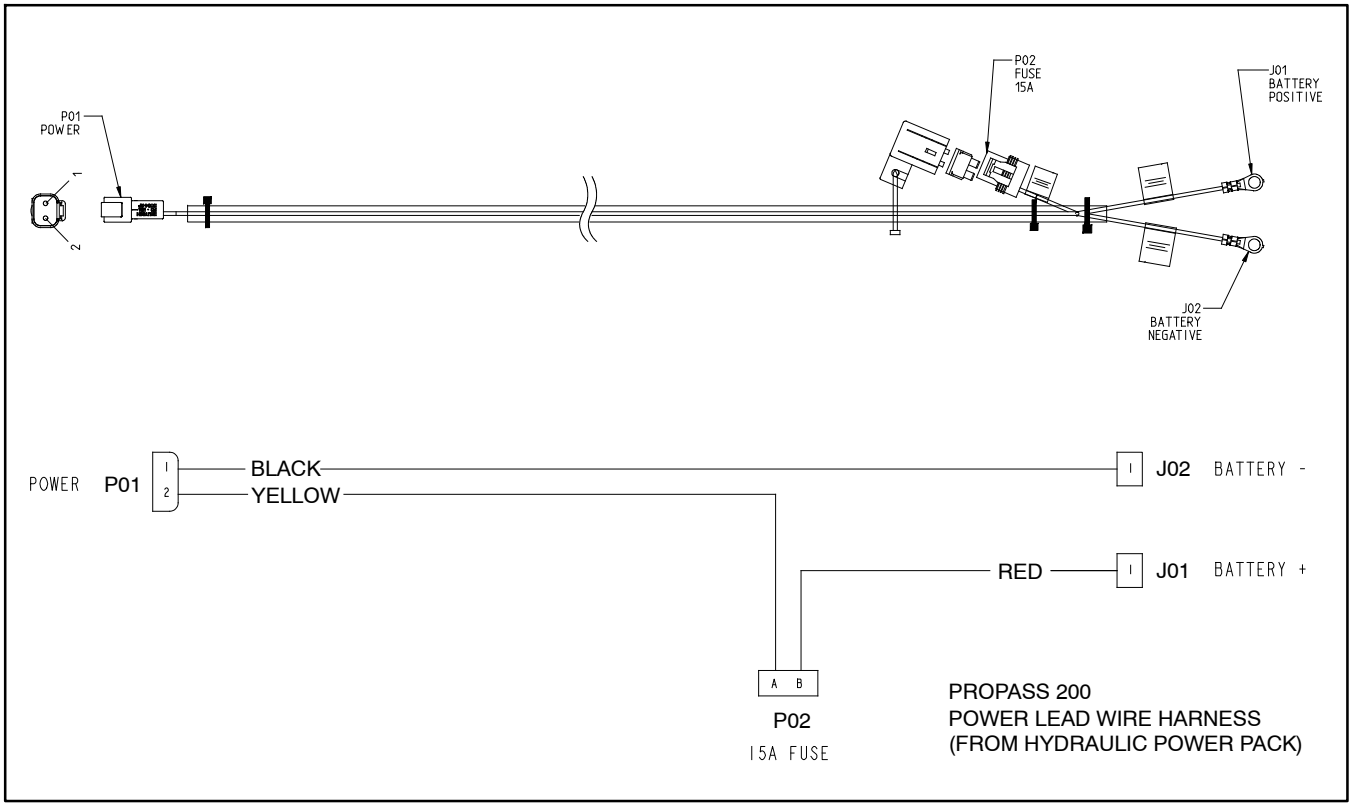

Figure 6

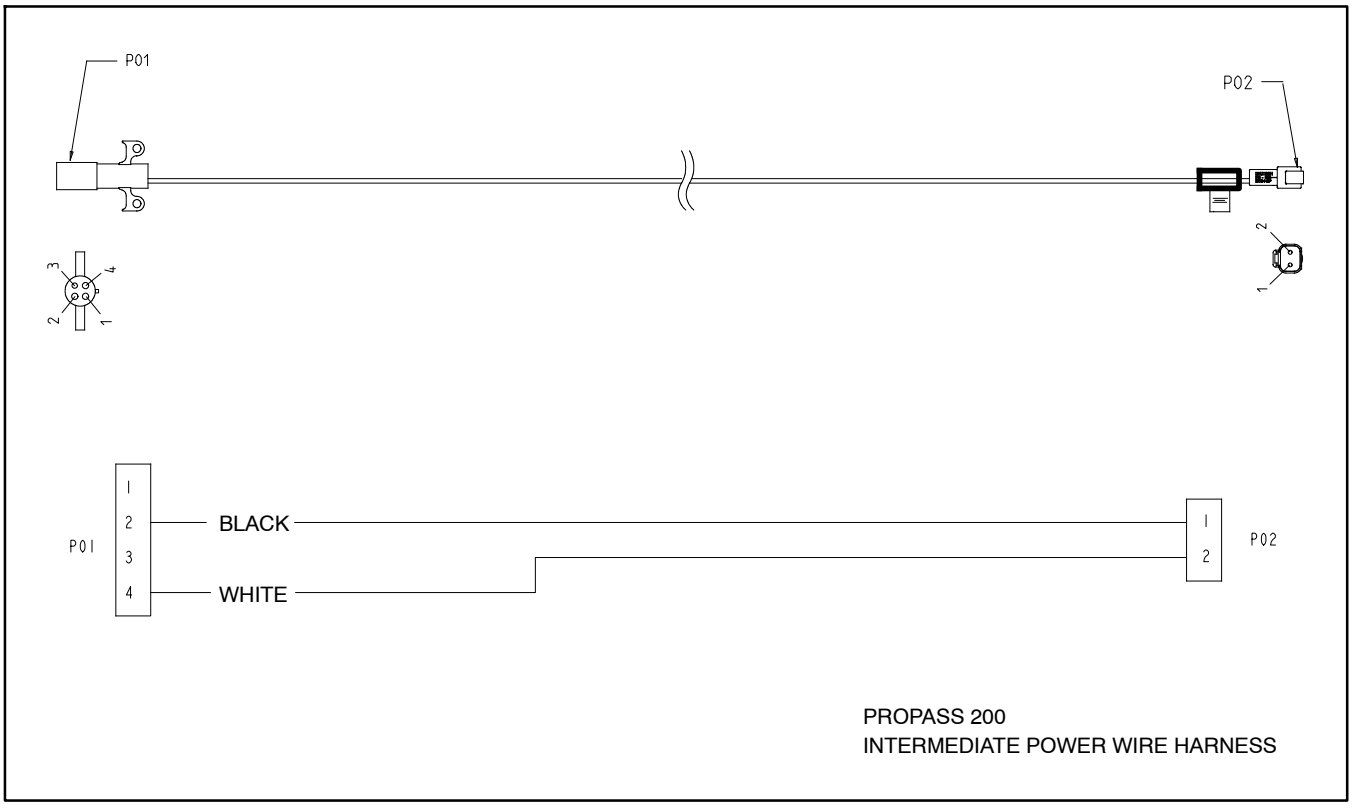
P01
P02
3
4
2
1
2
1
P01
1
2
3
4
BLACK
WHITE
1
2
P02
PROPASS 200
INTERMEDIATE POWER WIRE HARNESS

Figure 7

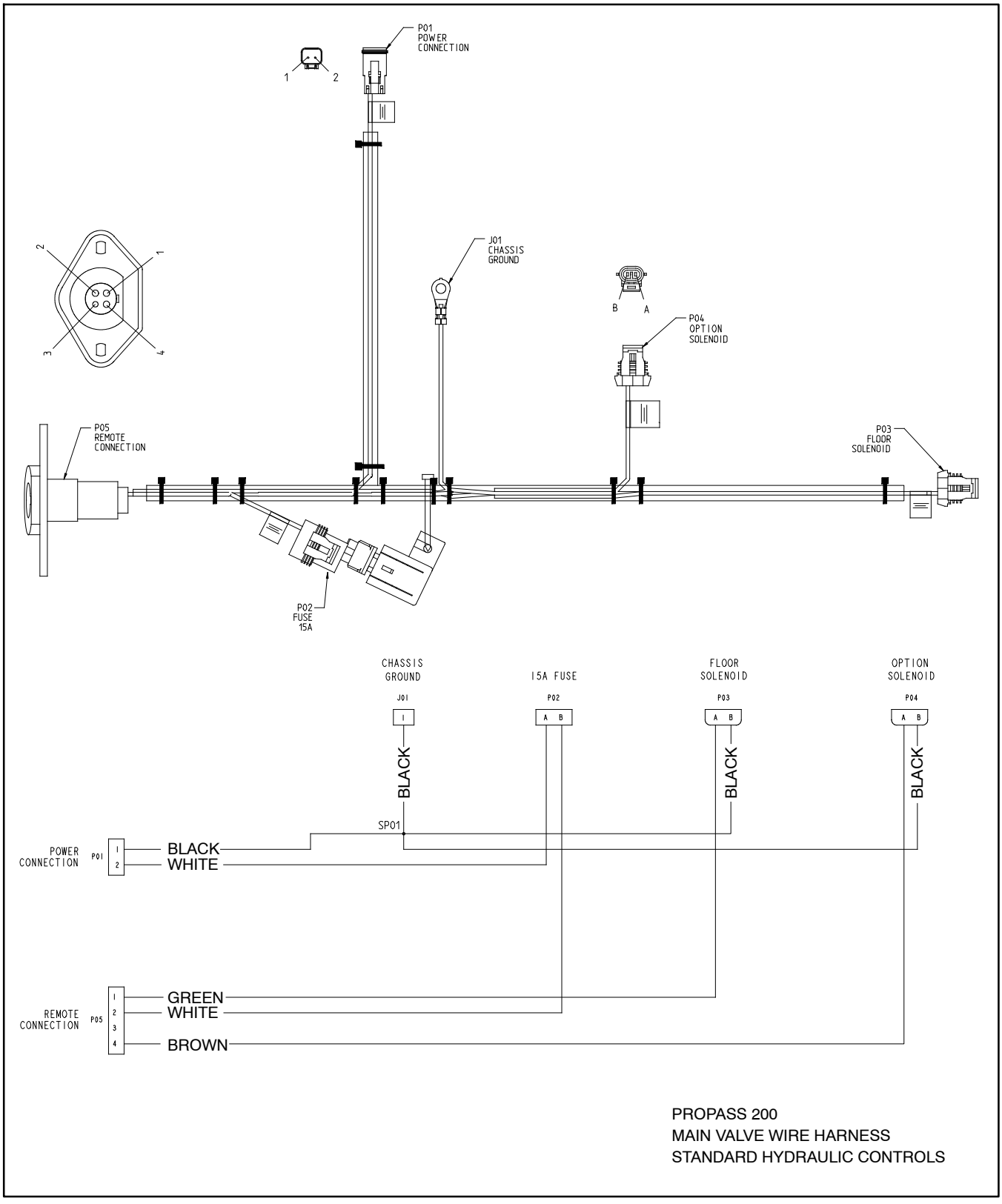
P01
POWER
CONNECTION
1
2
J01
CHASSIS
GROUND
B
A
P04
OPTION
SOLENOID
P05
REMOTE
CONNECTION
P03
FLOOR
SOLENOID
P02
FUSE
15A
CHASSIS
GROUND
J01
I5A FUSE
P02
FLOOR
SOLENOID
P03
OPTION
SOLENOID
P04
BLACK
BLACK
BLACK
SP01
POWER
CONNECTION
P01
BLACK
WHITE
REMOTE
CONNECTION
P05
GREEN
WHITE
BROWN
PROPASS 200
MAIN VALVE WIRE HARNESS
STANDARD HYDRAULIC CONTROLS

Figure 8

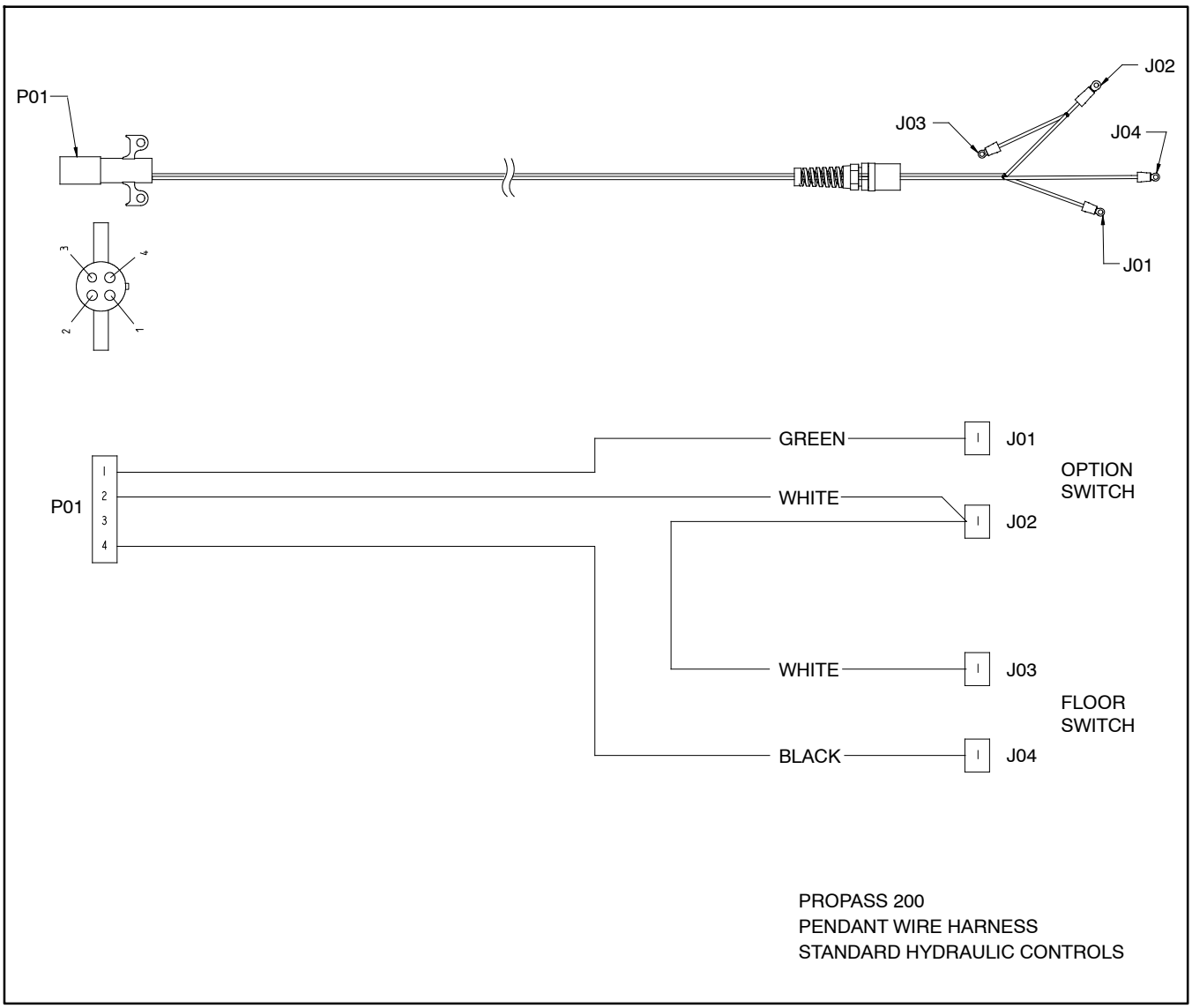
P01
J02
J03
J04
J01
3
4
2
1
GREEN
J01
OPTION
SWITCH
P01
1
2
3
4
WHITE
J02
WHITE
J03
FLOOR
SWITCH
BLACK
J04
PROPASS 200
PENDANT WIRE HARNESS
STANDARD HYDRAULIC CONTROLS

Figure 9

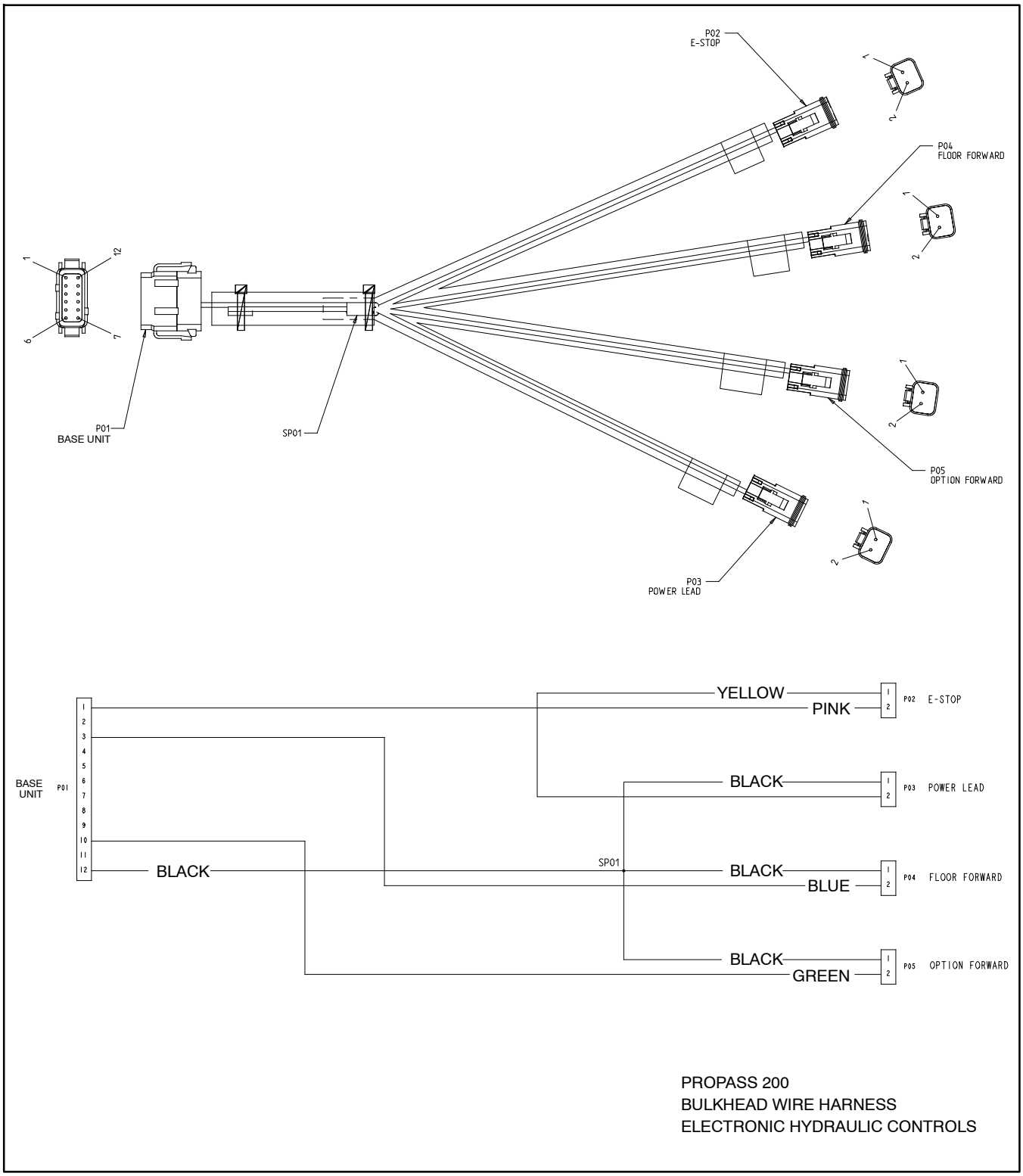
P02
E-STOP
P04
FLOOR FORWARD
P01
BASE UNIT
SP01
P05
OPTION FORWARD
P03
POWER LEAD
BASE
UNIT
P01
YELLOW
PINK
P02 E-STOP
BLACK
P03 POWER LEAD
SP01
BLACK
BLACK
BLUE
P04 FLOOR FORWARD
BLACK
GREEN
P05 OPTION FORWARD
PROPASS 200
BULKHEAD WIRE HARNESS
ELECTRONIC HYDRAULIC CONTROLS

Figure 10

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Special Tools

Order special tools from your Toro distributor. Some tools may also be available from a local supplier.

Multimeter

The multimeter can test electrical components and circuits for current (amps), resistance (ohms) or voltage. Obtain this tool locally.

NOTE: Toro recommends the use of a DIGITAL Volt-Ohm-Amp multimeter when testing electrical circuits. The high impedance (internal resistance) of a digital meter in the voltage mode will make sure that excess current is not allowed through the meter. This excess current can cause damage to circuits not designed to carry it.

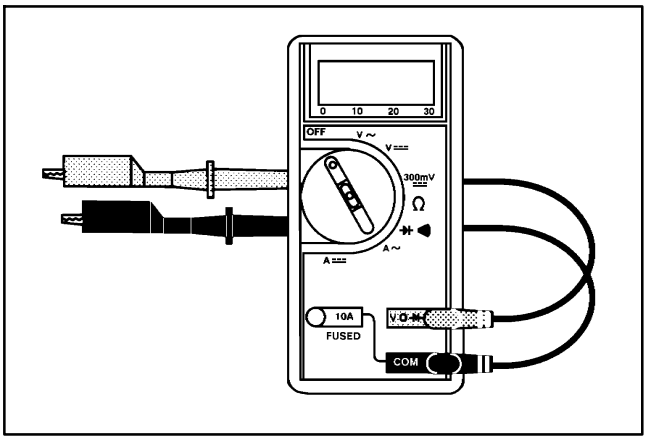

Figure 11

Dielectric Lubricant/Sealant

Dielectric lubricant should be used to prevent corrosion of non-sealed connection terminals. To ensure complete coating of terminals, liberally apply lubricant to both component and wire harness connector, plug connector to component, unplug connector, reapply lubricant to both surfaces and reconnect harness connector to component. Connectors should be thoroughly packed with lubricant for effective results.

Toro Part Number: **107-0342**

Figure 12

Skin-Over Grease

Special non-conductive grease which forms a light protective skin to help waterproof electrical switches and contacts.

Toro Part Number: **TOR50547**

Figure 13

Battery Terminal Protector

Aerosol spray that should be used on battery terminals to reduce corrosion problems. Apply battery terminal protector after the battery cable has been secured to the battery terminal.

Toro Part Number: **107-0392**

Figure 14

Battery Hydrometer

Use the battery hydrometer when measuring specific gravity of battery electrolyte. Obtain this tool locally.

Figure 15

Troubleshooting

CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, there must be a good understanding of the electrical circuits and components used on this machine (see Electrical Schematics in this chapter).

If the machine has any interlock switches by-passed, reconnect the switches for proper safety and troubleshooting.

Problem	Possible Causes
No ProPass functions operate (machines with standard hydraulics).	Electrical power to ProPass components is not available (e.g. power harness not connected to tow vehicle, tow vehicle key not ON, vehicle battery is discharged). Pendant is not connected to ProPass connector. One or both of the fuses (15 Amp) is faulty. Hydraulic problem exists (see Chapter 3 - Hydraulic System).
No ProPass functions operate (machines with electronic hydraulics). NOTE: Check wireless remote LCD display and base unit LED's for help in troubleshooting.	E-stop button is not pulled out. Electrical power to ProPass components is not available (e.g. power harness not connected to tow vehicle, tow vehicle key not ON, vehicle battery is discharged). In-line fuse (15 Amp) is faulty. Wireless remote has not been turned ON. Wireless remote has timed out due to thirty (30) minutes of inactivity. Wireless remote batteries are discharged. Wireless remote and base unit are not associated (NOTE: There may be a short delay for base fault to be listed in display). Hydraulic problem exists (see Chapter 3 - Hydraulic System). Wireless remote is faulty. Base unit is faulty.
Rear option does not function (machines with standard hydraulics).	Rear option switch in pendant is OFF. Rear option switch in pendant is faulty. Rear option solenoid valve coil or circuit wiring is faulty. Hydraulic problem exists (see Chapter 3 - Hydraulic System).

Problem	Possible Causes
Rear option does not function (machines with electronic hydraulics). NOTE: Start button on remote must be pushed twice to activate rear option. Also, check wireless remote LCD display and base unit LED's for help in troubleshooting.	Wireless remote has not been turned ON. Wireless remote has timed out due to thirty (30) minutes of inactivity. Wireless remote settings are incorrect. Proportional flow valve coil (PV1) or circuit wiring is faulty. Hydraulic problem exists (see Chapter 3 – Hydraulic System). Wireless remote is faulty. Base unit is faulty.
Floor does not function (machines with standard hydraulics).	Floor switch in pendant is OFF. Floor switch in pendant is faulty. Floor solenoid valve coil or circuit wiring is faulty. Hydraulic problem exists (see Chapter 3 – Hydraulic System).
Floor does not function (machines with electronic hydraulics). NOTE: Check wireless remote LCD display and base unit LED's for help in troubleshooting.	Wireless remote has not been turned ON. Make sure that floor start–up procedure has been correctly completed with remote. Wireless remote has timed out due to thirty (30) minutes of inactivity. Wireless remote settings are incorrect. Proportional solenoid valve coil (SP1) or circuit wiring is faulty. Hydraulic problem exists (see Chapter 3 – Hydraulic System). Wireless remote is faulty. Base unit is faulty.

Component Testing

For accurate resistance and/or continuity checks, electrically disconnect the component being tested from the circuit (e.g. unplug the wire harness connector from component before checking continuity on the component terminals).

CAUTION

When testing electrical components for continuity with a multimeter (ohms setting), make sure that power to the circuit has been disconnected.

E-Stop Button (Machines with Electronic Hydraulic Controls)

On ProPass machines with electronic hydraulic controls, the E-stop button is used to disconnect battery power to the machine. The E-stop button is a normally closed switch that is located on the control panel guard (Fig. 16).

The E-stop button is a two (2) position switch with two (2) terminals that can be tested with a multimeter. Make sure that electrical power to the E-stop button is disconnected before testing the button. Disconnect E-stop button connector from machine wire harness. Check the continuity of the button by connecting a multimeter (ohms setting) across the button harness connector terminals. There should not be continuity (infinite ohms) between the connector terminals when the button is pressed in. When the button is pulled out, there should be continuity (zero ohms) between the connector terminals.

If E-stop button testing determines that the button is faulty, remove button from control panel guard and replace button assembly. Make sure that wire harness connector is attached to the button after testing and/or replacement.

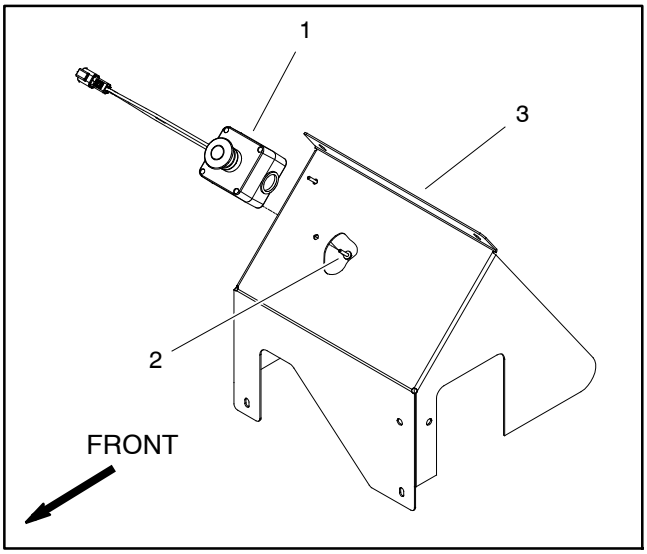

Figure 16

1. **E-Stop button**
2. **Screw (2 used)**
3. **Control panel guard**

Pendant Assembly (Machines with Standard Hydraulic Controls)

The pendant assembly allows the machine operator to engage the rear option (twin spinner or conveyor) and the floor from the tow vehicle operator's position. The pendant assembly includes two (2) switches, the junction box and the wire harness (Fig. 17).

Both of the switches used in the ProPass pendant are two (2) position switches with two (2) terminals. To access the switch terminals for testing, remove the cover from the bottom of the junction box. Make sure that electrical power to the switches is disconnected before testing the switches. Use a multimeter to check the switch for continuity. There should not be continuity between the switch terminals when the switch is in the OFF position as shown in Figure 17. There should be continuity between the switch terminals when the switch is in the ON position.

If switch testing determines that a switch is faulty, remove switch from junction box and replace switch (Fig. 18). Make sure that wire harness connectors are attached to correct switch terminals (Fig. 19).

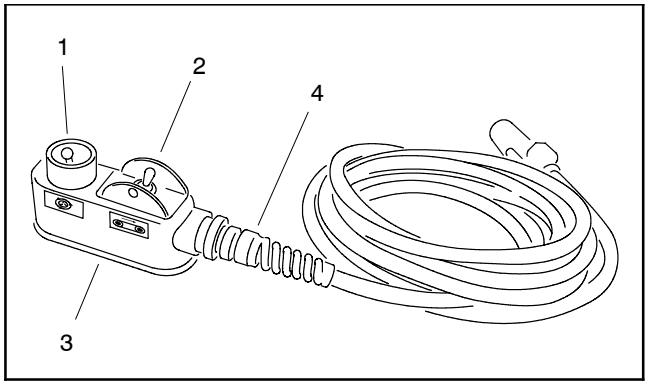

Figure 17

1. **Rear option switch**
2. **Floor switch**
3. **Junction box**
4. **Wire harness**

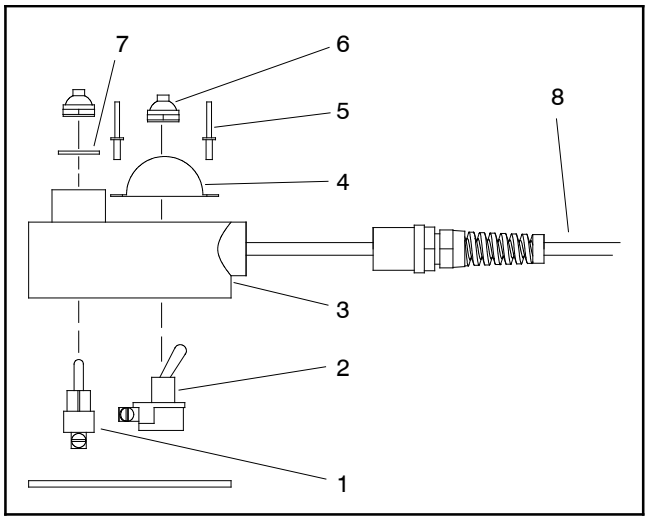

Figure 18

1. **Rear option switch**
2. **Floor switch**
3. **Junction box**
4. **Switch guard**
5. **Pop rivet (2 used)**
6. **Switch boot (2 used)**
7. **Washer**
8. **Wire harness**

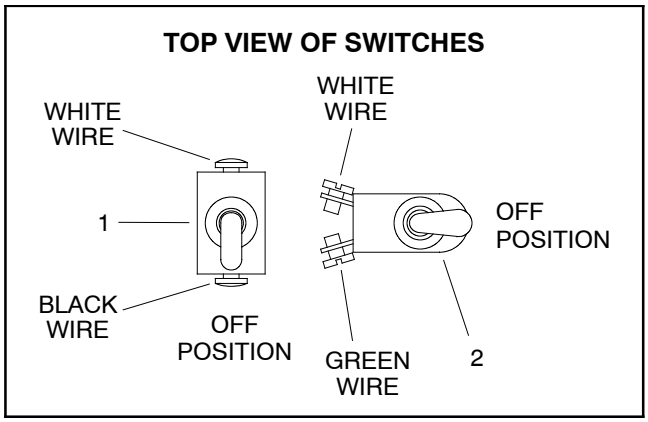

Figure 19

1. **Spinner switch**
2. **Floor switch**

Wireless Remote (Machines with Electronic Hydraulic Controls)

The wireless remote is a solid state electrical device that sends radio frequency (RF) signal inputs to the machine wireless remote base unit for control of machine electrical operation. The wireless remote has sufficient range to send an RF signal to the remote base unit from the tow vehicle operator position.

The wireless remote uses two (2) LED's to indicate remote operation. The green LED flashes when a base unit signal is being sent to the remote. The green LED will also illuminate when a remote button is pressed. The amber LED flashes when a signal is being received from the remote base unit. The amber LED will illuminate when one or more base unit outputs are active.

Button Operation

NOTE: Refer to the Operator's Manual for detailed information on wireless remote operation.

Pressing the ON/OFF button turns the machine base unit ON or OFF for ProPass operation.

The ALL START button is used to begin ProPass rear option (twin spinner or conveyor) and floor operation.

Four (4) buttons are used to control the floor: start, stop, increase floor speed and decrease floor speed.

Four (4) buttons are used to control the rear option (twin spinner or conveyor): start, stop, increase rear option speed and decrease rear option speed.

The ALL STOP button stops floor and rear option operation.

Four (4) buttons are used for preset programming for the ProPass. Three (3) presets can be made to allow quick option speed values for the floor and rear option. The STORE button allows the presets to be adjusted.

Wireless Remote Batteries

The wireless remote is powered by four (4) AA alkaline batteries. When the low battery power warning is displayed on the remote LCD display, the batteries should be replaced. Remove battery cover on rear of remote and replace batteries noting polarity marks in remote for proper installation of batteries.

NOTE: Holding down the remote ALL STOP and OPTION STOP buttons simultaneously results in display of battery life expectancy.

LCD Display

The wireless remote LCD display can be used to identify activity between the remote and the base unit. LCD display messages are included on the following page.

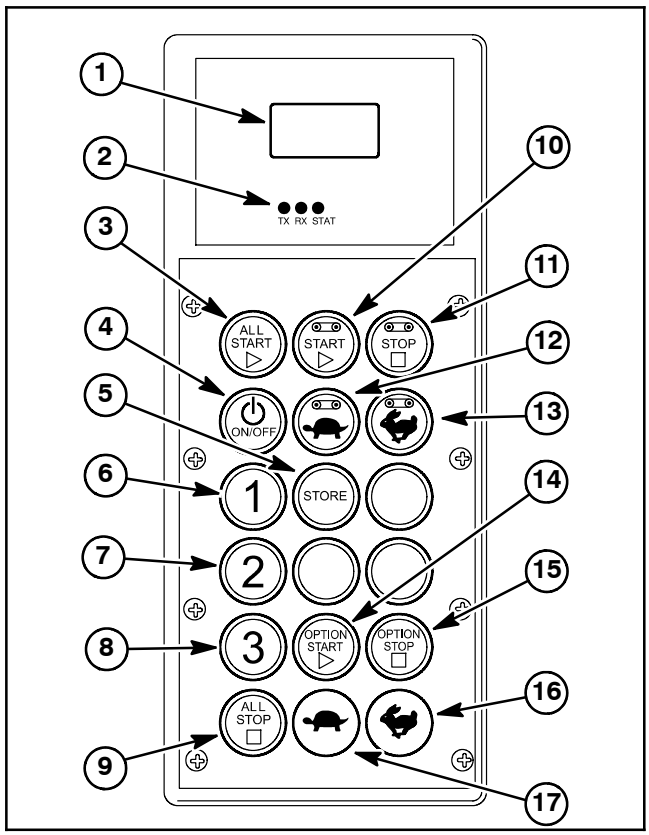

Figure 20

1. **LCD display**
2. **Controller status LED's**
3. **All start button**
4. **ON/OFF button**
5. **Store button**
6. **Preset 1 button**
7. **Preset 2 button**
8. **Preset 3 button**
9. **All stop button**
10. **Floor start button**
11. **Floor stop button**
12. **Floor speed increase**
13. **Floor speed decrease**
14. **Option start button**
15. **Option stop button**
16. **Option speed increase**
17. **Option speed decrease**

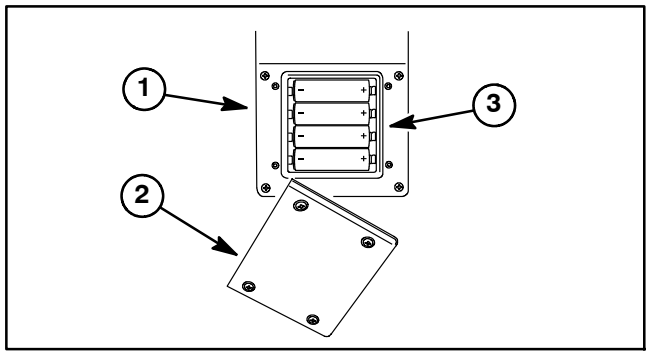

Figure 21

1. **Rear of remote**
2. **Battery cover**
3. **Battery location**

Displayed Message	Meaning
ASSOC PENDING	Association between remote and base unit has yet to be made.
ASSOC ACTIVE	Association attempt between remote and base unit is in progress.
CLR CHAN SCAN	A scan to find a clear channel is in progress.
POW UP BUNIT	The base unit is being powered up.
ASSOC SUCCESS	Association between remote and base unit has been made.
ALL STORE	Store all currently set values into memory.
OPTION STORE	Store the current rear option settings into memory.
FLOOR STORE	Store the current floor settings into memory.
PRESET 1 STORE	Store the current PRESET 1 setting into memory.
PRESET 2 STORE	Store the current PRESET 2 setting into memory.
PRESET 3 STORE	Store the current PRESET 3 setting into memory.
WAITING FOR BASE	Remote is waiting for a response from the base unit (NOTE: Make sure that E–Stop button is pulled out and all electrical components are connected).
COMMAND POW DOWN	Operator has pressed the ON/OFF button to power down.
LOW BAT POW DOWN	Cyclic warning that the remote batteries are low and need to be changed.
INACTIV POW DOWN	Automatic shutdown after thirty (30) minutes of remote button inactivity.
SOFTWARE VER XX	Software version XX is being used.
BAT XX% BUMPS XX	Remaining battery life in percentage. Number of base unit messages per second being received. NOTE: See Operator's Manual for procedure to access these display features.
CHANNEL X	Channel in Ghz currently being used for communication between remote and base unit. NOTE: If area interference prevents reliable remote communications, re–associating the remote to the base unit might access different channel with less interference (see Operator's Manual for association procedure).
HHELD ID XXXXXX	Identity of the wireless remote. NOTE: See Operator's Manual for procedure to access this display feature.
BUINT ID XXXXXX	Identity of the base unit. NOTE: See Operator's Manual for procedure to access this display feature.
FLRS XX% OPTS XX%	Display of the stored floor speed or rear option speed percents after initially pressing floor start or option start button. The operator can either accept the stored setting or change it before starting the floor or rear option by pressing the start button a second time.
FLR XX% OPT XX%	During floor operation, the current floor speed in percent. During rear option operation, the current rear speed in percent.
SW STUCK XXXXXX	Remote button is stuck. XXXXXX identifies the button that is stuck.

Wireless Remote Base Unit (Machines with Electronic Hydraulic Controls)

The base unit is a solid state electrical device that receives signal inputs from the wireless remote and uses those inputs to control machine electrical operation. The base unit is attached to the front hopper wall next to the hydraulic control manifold (Fig. 22).

Inputs from the wireless remote are monitored by the base unit. Outputs from the base unit to the floor and rear option (twin spinner or conveyor) solenoid valve coils are controlled based on the inputs received by the base unit.

NOTE: Use the wireless remote LCD display to make sure that association exists between base unit and wireless remote (see Wireless Remote (Machines with Electronic Hydraulic Controls) in this section).

The base unit does not connect to an external computer or hand held device, can not be re-programmed and does not record any fault data.

Because of the solid state circuitry built into the base unit, there is no reliable method to test it. The base unit may be damaged if an attempt is made to test it with an electrical test device, such as a digital multimeter.

IMPORTANT: To prevent damage to the base unit, disconnect the wire harness connector from the base unit before performing any welding on the machine.

LED Operation

Four (4) status/diagnostic LED's can be used to determine the state of the base unit (Fig. 23).

The OUT LED will be green when an output is active. This LED will be amber if there is an output issue. If this LED is not illuminated, check the wireless remote LED's and LCD display for correct remote operation.

The HEALTH LED will pulse green when communication between the base unit and the wireless remote is functioning. If this LED is blinking amber, an internal base unit problem exists. If this LED is blinking red, an over temperature situation exists.

The TX/RX LED will be amber when the base unit is communicating with the wireless remote. If this LED is not illuminated, check for obstructions preventing line-of-sight transmission with wireless remote and make sure that wireless remote is active. It may be necessary to re-associate the wireless remote with the base unit.

The POWER LED will be amber when power exists to the base unit. If this LED is either red or green, an internal base unit problem exists.

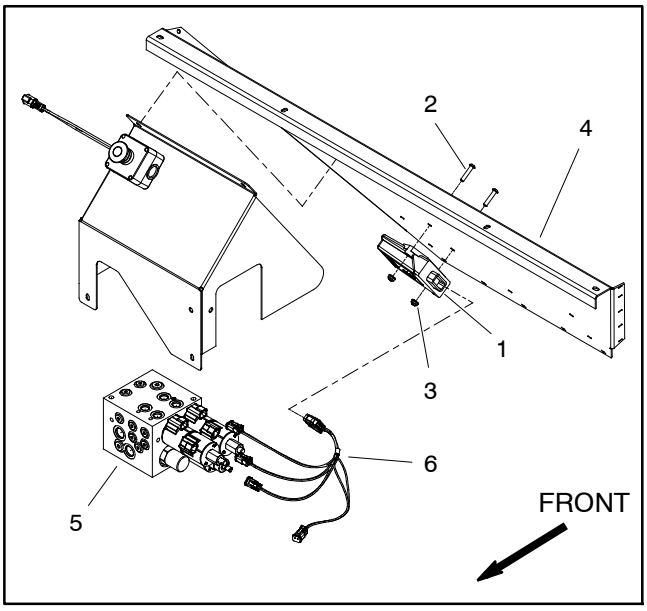

Figure 22

1. **Base unit**
2. **Screw (2 used)**
3. **Flange nut (2 used)**
4. **Front hopper wall**
5. **Hydraulic manifold**
6. **Bulkhead wire harness**

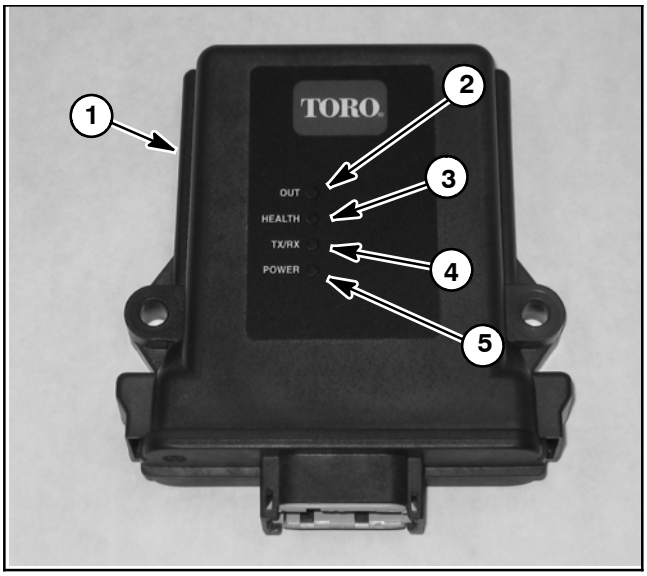

Figure 23

1. **Base unit**
2. **Out LED**
3. **Health LED**
4. **TX/RX LED**
5. **Power LED**

Hydraulic Solenoid Valve Coils

The ProPass hydraulic system uses several hydraulic solenoid valve coils for system control. When the solenoid coils are energized, hydraulic valve shift occurs to control hydraulic flow.

Two (2) identical solenoid valve assemblies are used on machines with standard hydraulic controls (Fig. 24). The solenoid valve coils used on these assemblies are identical.

Machines with electronic hydraulic controls use two (2) different solenoid valve coils (Fig. 25). The double coils used on the solenoid valves are identical coils. The single coil used on the proportional flow valve is a different coil.

Testing of the hydraulic solenoid valve coils can be done with the coil installed on the hydraulic valve. The coil height can be used to identify the resistance of the coil.

Testing

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Locate solenoid coil that is to be tested on hydraulic control manifold.

3. Disconnect wire harness electrical connector from the hydraulic solenoid valve coil that is to be tested (Fig. 24 or 25).

NOTE: Prior to taking small resistance readings with a digital multimeter, short the meter test leads together. The meter may display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from from the measured value of the component you are testing.

4. Using a multimeter (ohms setting), measure resistance between the two (2) connector terminals on the solenoid valve coil. The resistance for the solenoid coils is identified below:

Solenoid Coil Height	Resistance
1.960” (49.8 mm)	7.1 ohms
2.450” (62.2 mm)	4.5 ohms

5. If solenoid coil resistance is incorrect, replace solenoid coil (see Solenoid Valve Assembly (Machines with Standard Hydraulic Controls) or Hydraulic Control Manifold (Machines with Electronic Hydraulic Controls) in the Service and Repairs section of Chapter 3 – Hydraulic System).

6. When testing is complete, connect wire harness electrical connector to the solenoid valve coil.

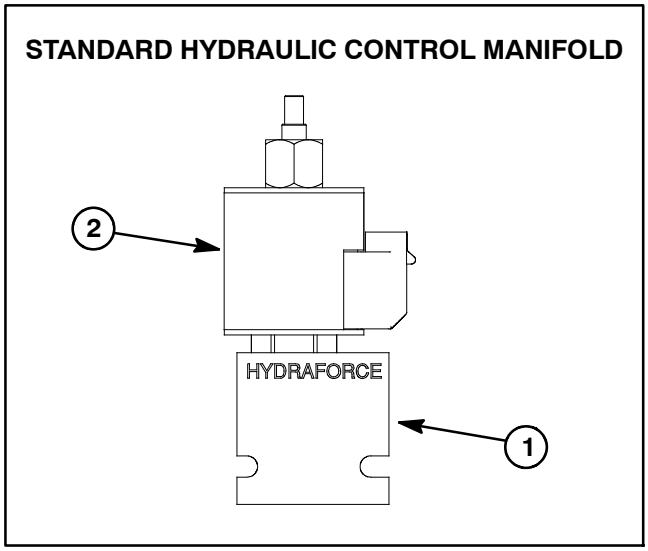

Figure 24

1. Manifold **2. 1.960” solenoid coil**

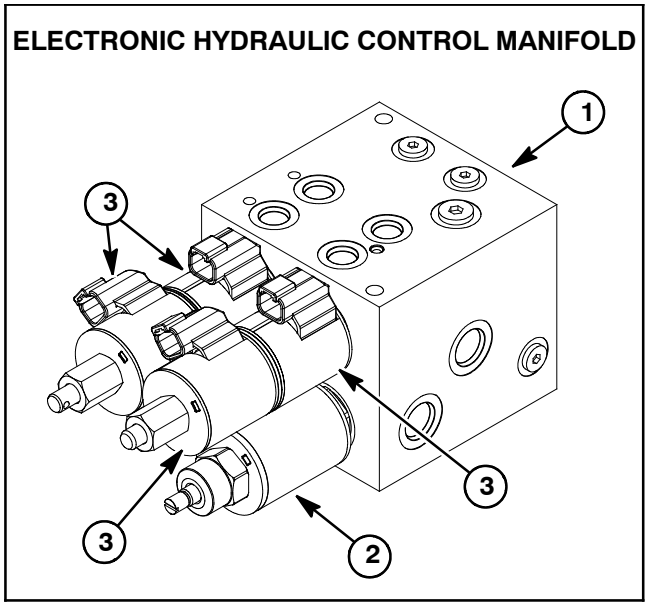

Figure 25

1. Manifold **3. 1.960” solenoid coil**
2. 2.450” solenoid coil

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Chapter 5

Chassis

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General Information

Operator's Manual

The Operator's Manual provides information regarding the operation, general maintenance and maintenance intervals for your ProPass machine. Refer to this publication for additional information when servicing the machine.

Parts Catalog

The Parts Catalog can be used to provide general disassembly and assembly information for the chassis on your ProPass machine. Refer to this publication for additional information when servicing the machine.

Bed Guards

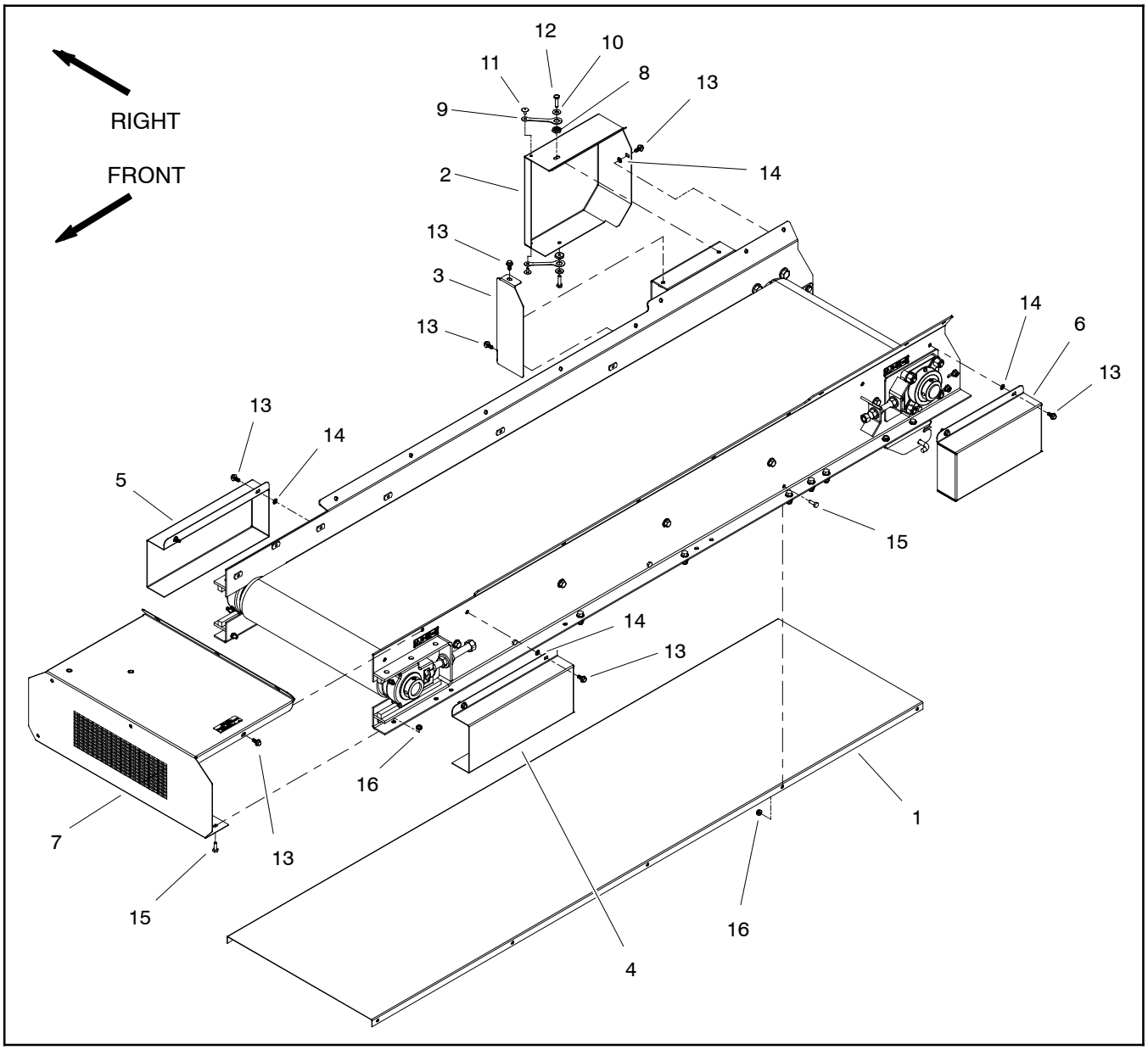

Figure 1

1. **Bottom guard**
2. **RH drive guard**
3. **Guard cap**
4. **LH idler guard**
5. **RH idler guard**
6. **LH drive guard**
7. **Front rinse guard**
8. **Shoulder nut (2 used)**
9. **Lanyard (2 used)**
10. **Flat washer (2 used)**
11. **Rivet (2 used)**
12. **Cap screw (2 used)**
13. **Cap screw**
14. **Screw retainer**
15. **Cap screw**
16. **Flange nut**

Disassembly (Fig. 1)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. If front rinse guard is to be removed from machine with electronic controls (Fig. 2):

   A. Disconnect E-stop button from machine wire harness.

   B. Remove fasteners that secure control panel guard to machine. Remove control panel guard.

   C. Remove the two (2) cap screws, lock washers and flat washers that secure hydraulic control manifold to rinse guard.

   D. Raise and support hydraulic manifold away from rinse guard.

3. Using Figure 1 as a guide, remove necessary bed guards from frame to allow access to floor drive components.

Assembly (Fig. 1)

1. Secure all removed bed guards to frame using Figure 1 as a guide.

2. If front rinse guard was removed from machine with electronic controls, secure hydraulic manifold, control panel guard and E-stop button to machine (Fig. 2).

MACHINES WITH ELECTRONIC HYDRAULIC CONTROLS

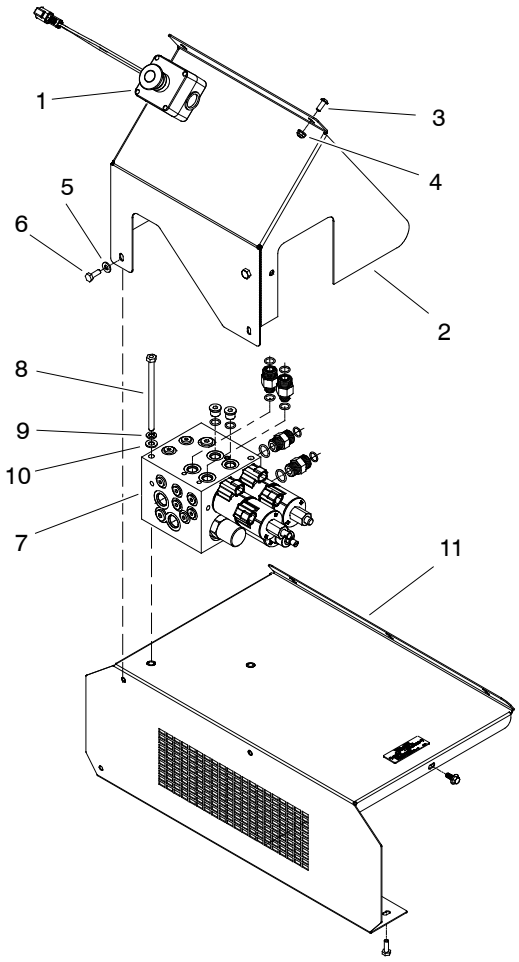

Figure 2

1. **E-stop button**
2. **Control panel guard**
3. **Screw (2 used)**
4. **Flange nut (2 used)**
5. **Flat washer (2 used)**
6. **Cap screw (2 used)**
7. **Hydraulic manifold**
8. **Cap screw (2 used)**
9. **Lock washer (2 used)**
10. **Flat washer (2 used)**
11. **Front rinse guard**

Floor Motor Drive

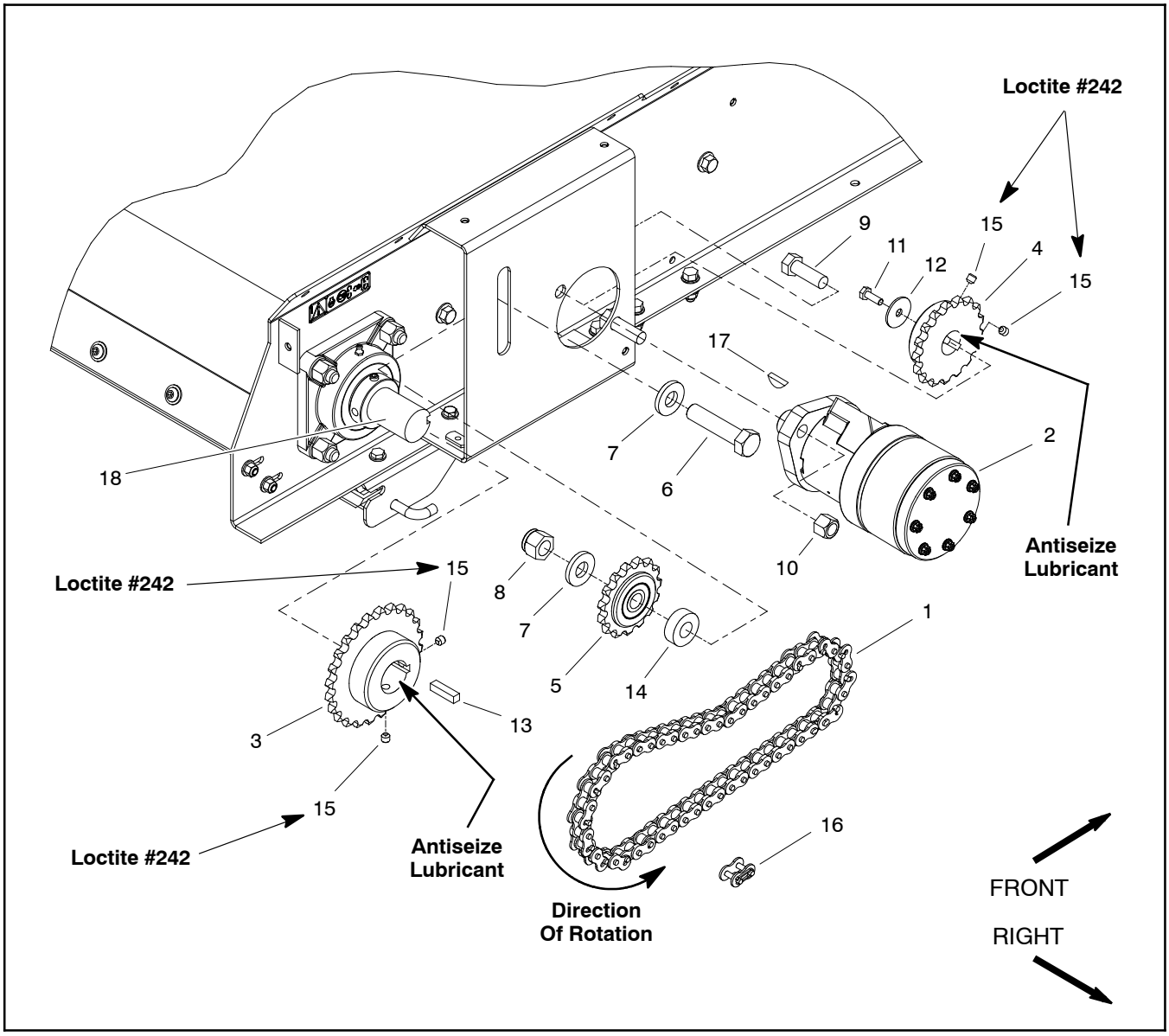

Figure 3

1. Drive chain
2. Hydraulic floor motor
3. Sprocket
4. Sprocket
5. Idler sprocket
6. Cap screw
7. Flat washer (2 used)
8. Lock nut
9. Cap screw (2 used)
10. Lock nut (2 used)
11. Cap screw
12. Flat washer
13. Square key
14. Spacer
15. Set screw (2 used per sprocket)
16. Master link
17. Woodruff key
18. Drive roller shaft

Disassembly (Fig. 3)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove guard cap and RH drive guard from frame to allow access to floor drive components (Fig. 4).

3. Loosen cap screw and lock nut that secure idler sprocket (item 5) to frame. Move idler sprocket to remove tension from drive chain.

4. Locate and remove master link (item 16) from drive chain. Note direction of master link clip for assembly purposes. Remove drive chain.

5. Loosen set screws (item 15) that secure sprocket to shaft of drive roller. Slide sprocket from shaft. Remove square key (item 13) from shaft.

NOTE: If floor motor (item 2) needs to be removed, see Floor Motor in the Service and Repairs section of Chapter 3 – Hydraulic System.

Assembly (Fig. 3)

1. Apply antiseize lubricant to drive roller shaft.

2. Position square key to slot in drive roller shaft and then slide sprocket (item 3) onto shaft.

3. Fit drive chain onto floor motor sprocket, drive roller sprocket and idler sprocket. Install master link (item 16) to drive chain and secure ends with master link clip. Make sure that the closed end of the master link clip is facing the direction of chain rotation.

NOTE: Direction of normal roller rotation is shown in Figure 5 as viewed from right side of conveyor.

4. Check that chain is aligned to sprockets. If alignment adjustment is necessary, move sprocket on drive roller shaft as needed.

5. Apply Loctite #242 (or equivalent) to threads of set screws (item 15). Tighten set screws to secure sprocket to drive roller shaft.

6. Move idler sprocket (item 5) to tension the drive chain. Secure idler sprocket by tightening cap screw and lock nut. A properly adjusted chain should allow for free rotation of drive components.

7. Secure RH drive guard and guard cap to frame (Fig. 4).

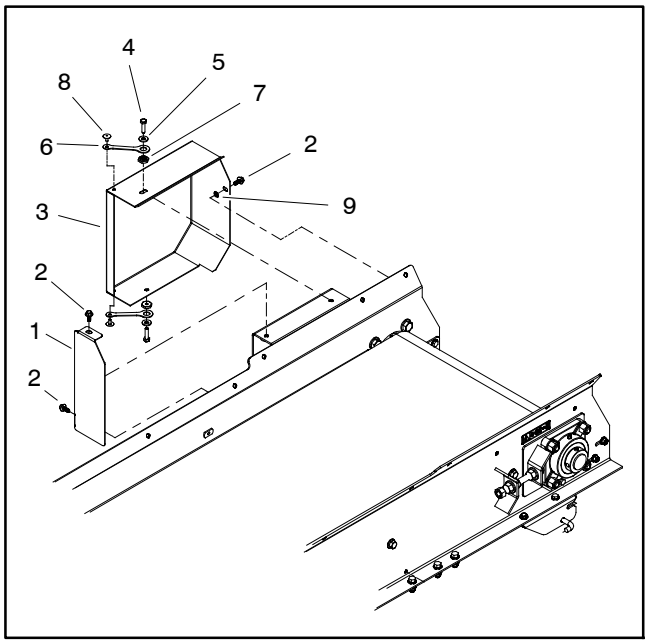

Figure 4

1. **Guard cap**
2. **Cap screw (3 used)**
3. **RH drive guard**
4. **Cap screw (2 used)**
5. **Flat washer (2 used)**
6. **Lanyard (2 used)**
7. **Shoulder nut (2 used)**
8. **Rivet (2 used)**
9. **Screw retainer**

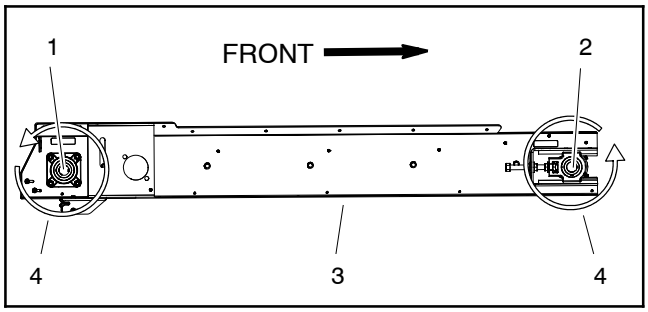

Figure 5

1. **Drive roller**
2. **Idler roller**
3. **RH conveyor frame**
4. **Rotation direction**

Drive Roller Bearings

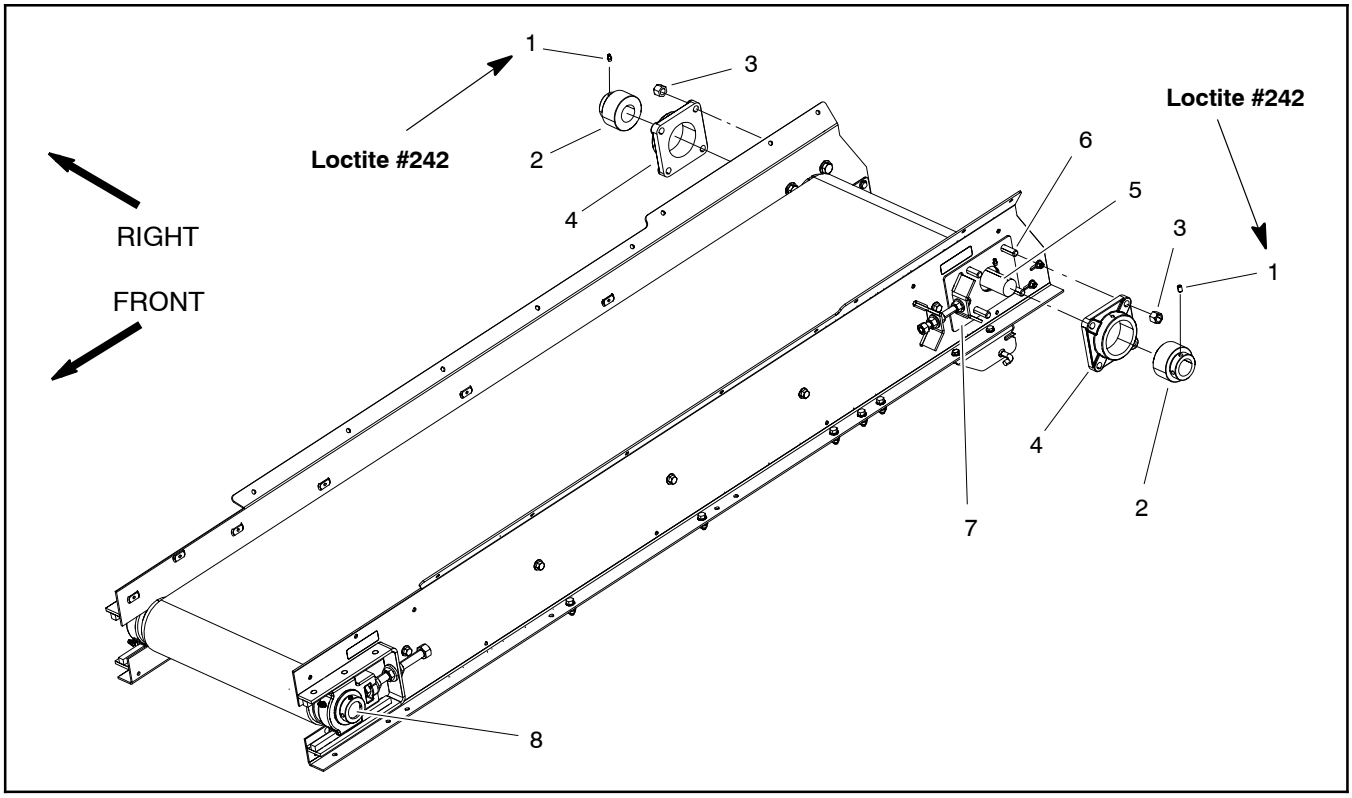

Figure 6

1. **Set screw**
2. **Locking collar**
3. **Lock nut (4 used per bearing)**
4. **Bearing assembly**
5. **Drive roller shaft**
6. **Cap screw (4 used per bearing)**
7. **Alignment plate**
8. **Idler roller shaft**

Use this procedure for service of the drive roller bearings at the rear of the machine.

Disassembly (Fig. 6)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove guards from frame to allow access to idler roller and drive roller components (see Bed Guards in this section).

3. On both sides of machine, loosen tension on floor conveyor belt at idler roller shaft (Fig. 7):

   A. Retain tensioner rod with wrench to prevent it from turning.

   B. Loosen adjusting jam nut to remove tension on floor conveyor belt. If locking jam nut is left in position, applying correct tension to conveyor belt will be easier during assembly.

   C. Repeat for other side of machine.

4. If right side bearing is to be removed from machine, remove drive chain and sprocket from drive roller (see Floor Motor Drive in this section).

5. Loosen and remove locking collar from drive roller shaft (Fig. 8):

NOTE: Direction of normal roller rotation is shown in Figure 9 as viewed from left side of conveyor.

   A. Loosen set screw in locking collar.

   B. Using blind hole in locking collar as an impact point, unlock collar by striking it with a punch in the opposite direction of drive roller shaft rotation.

   C. Slide locking collar from bearing assembly and drive roller shaft.

NOTE: If LH bearing is being removed from machine, leave alignment plate (item 7) tightened to conveyor frame if possible. This will reduce the need for re-aligning bearing during assembly.

6. Remove four (4) lock nuts (item 3) that retain bearing assembly to conveyor frame. Remove bearing from drive roller shaft and frame. Leave cap screws in frame.

Assembly (Fig. 6)

1. Slide bearing onto cap screws that are inserted into frame. Secure bearing to frame with four (4) lock nuts (item 3).

2. Install and tighten locking collar to drive roller shaft (Fig. 8):

   A. Slide locking collar to bearing assembly and drive roller shaft.

   B. Using blind hole in locking collar as an impact point, lock collar by striking it with a punch in the direction of drive roller shaft rotation.

   C. Apply Loctite #242 (or equivalent) to threads of set screw. Install and tighten set screw to secure locking collar to drive roller shaft.

3. On both sides of machine, apply tension to floor conveyor belt at idler roller shaft (Fig. 7):

   A. Retain tensioner rod with wrench to prevent it from turning.

   B. Tighten adjusting jam nut to apply tension to floor conveyor belt. If locking jam nut is in original position, adjusting jam nut can be tightened until locking jam nut is secure.

   C. Repeat for other side of machine. Make sure that adjustments on both sides of the machine are equal.

4. Lubricate conveyor roller bearings at grease fittings.

5. Secure all removed guards to frame (see Bed Guards in this section).

IMPORTANT: Before adjusting conveyor belt tension, check for trapped spreading material between conveyor bed, belt and rollers. Clean machine as recommended in Operator's manual.

6. Check and adjust conveyor belt tension as needed (refer to Operator's Manual).

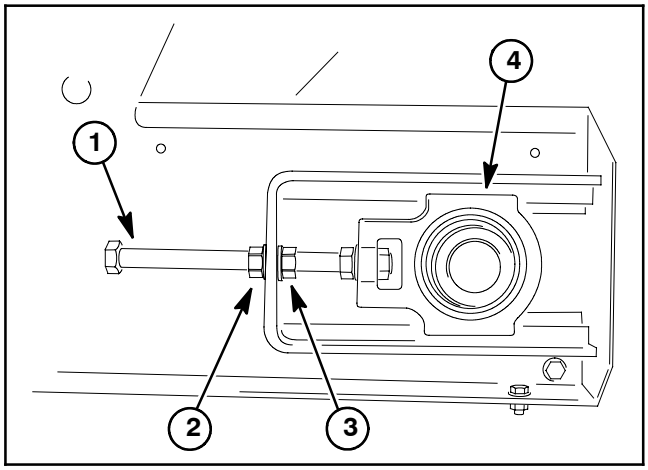

Figure 7

1. **Tensioner rod**
2. **Locking jam nut**
3. **Adjusting jam nut**
4. **Take up bearing**

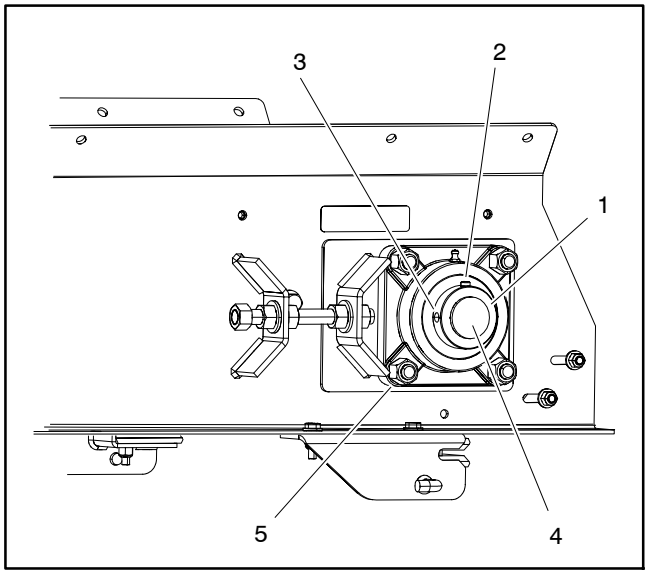

Figure 8

1. **Locking collar**
2. **Set screw**
3. **Blind hole**
4. **Drive roller shaft**
5. **Lock nut (4 used)**

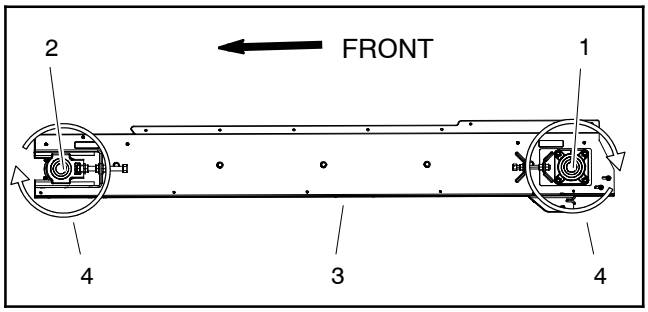

Figure 9

1. **Drive roller**
2. **Idler roller**
3. **LH conveyor frame**
4. **Rotation direction**

Floor Conveyor Belt

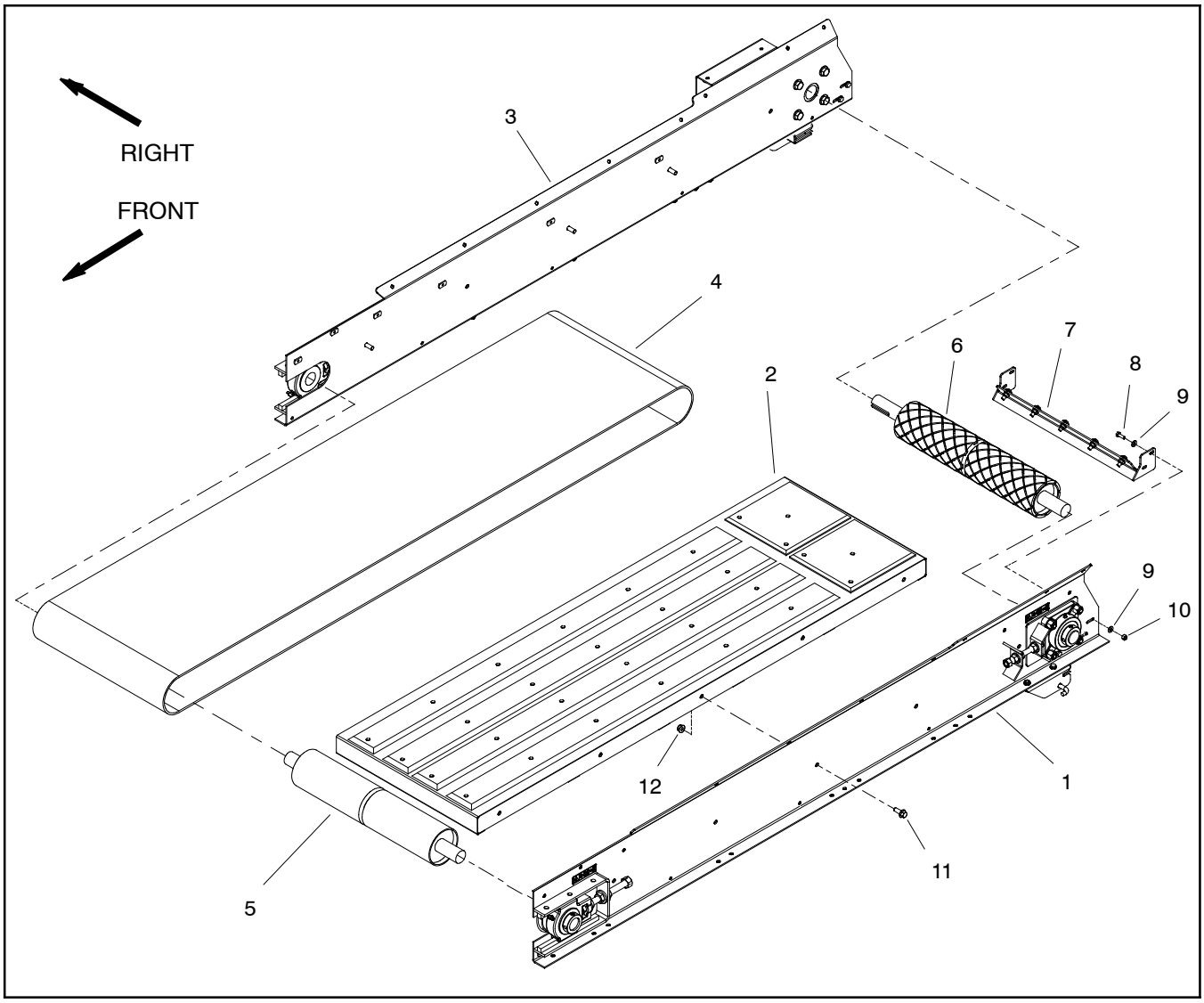

Figure 10

1. **LH conveyor frame assembly**
2. **Conveyor bed assembly**
3. **RH conveyor frame assembly**
4. **Floor conveyor belt**
5. **Idler roller**
6. **Drive roller**
7. **Scraper assembly**
8. **Cap screw (4 used)**
9. **Flat washer (8 used)**
10. **Lock nut (4 used)**
11. **Flange head screw (10 used)**
12. **Flange nut (10 used)**

To remove and replace the floor conveyor belt, removal of the left side conveyor frame is recommended. This procedure allows the hydraulic motor and drive chain components to remain in place on the right side conveyor frame.

Removal (Fig. 10)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Disconnect electrical power to ProPass machine.

3. Remove rear option assembly (twin spinner or conveyor) from machine.

4. Remove drive guards, idler guards, bottom guard and front rinse guard from frame (see Bed Guards in this section).

5. On both sides of machine, loosen tension on floor conveyor belt at idler roller shaft (see Drive Roller Bearings in this section).

6. Remove tension on floor drive chain by loosening cap screw and lock nut on drive chain idler sprocket (see Floor Motor Drive in this section).

7. Remove fasteners (four (4) cap screws, washers and lock nuts) that secure scraper assembly (item 7) to conveyor frame. Remove scraper assembly.

8. On left side of machine, loosen bearing locking collar on both idler and drive roller shafts (see Drive Roller Bearings and Idler Roller Bearings in this section).

CAUTION

To prevent personal injury, make sure that hopper assembly is properly supported as it is raised from the machine. Hopper assembly (without hydraulic components) weighs approximately 200 pounds (91 kg).

IMPORTANT: When raising the hopper assembly from the frame, lift at corners of hopper to prevent bending the hopper walls. Also, take care to not damage hydraulic lines, electrical harness or other components while raising the hopper.

9. Remove fasteners that secure hopper assembly with gate assembly to machine frame (Fig. 11). Once all fasteners have been removed, raise the hopper assembly enough so that left side of conveyor frame can be removed. Support hopper above the machine.

10. Remove fasteners (five (5) cap screws and flange nuts) that secure conveyor bed assembly (item 2) to left side of conveyor frame.

11. Remove fasteners that secure left side of conveyor frame to tow vehicle or tow chassis.

12. Support idler roller, drive roller and conveyor bed assembly to prevent them from moving.

13. Carefully slide left side of conveyor frame from idler and drive rollers and remove left side of frame.

14. Rotate conveyor belt so that section of belt without the v-guide on the bottom of the belt is around idler roller. Slide conveyor belt from idler and drive rollers and remove belt from machine.

Installation (Fig. 10)

IMPORTANT: Before conveyor belt installation, remove all trapped spreading material from conveyor bed, belt and rollers.

1. Install conveyor belt to ProPass in the reverse order of removal noting the following items:

A. Make sure that v-guide on bottom of conveyor belt is in the guides of both idler and drive rollers.

B. Inspect rubber skirts that seal the hopper and conveyor belt. If skirts are worn or damaged, replace them before installing hopper assembly.

C. As hopper assembly is lowered to machine frame, take care so that hydraulic lines, electrical harness or other components are not damaged.

D. Make sure to lock bearing collars by striking blind hole in locking collar with a punch in the direction of shaft rotation. Also, apply Loctite #242 (or equivalent) to threads of locking collar set screws before installing set screws in collars.

E. Before installing drive guards, idler guards, bottom guard and front rinse guard to machine, adjust conveyor belt tension and tracking (refer to Operator's Manual).

F. Make sure that rake tines on gate assembly are not scratching the floor belt after assembly is complete.

G. Grease all four (4) bearings after installation is complete.

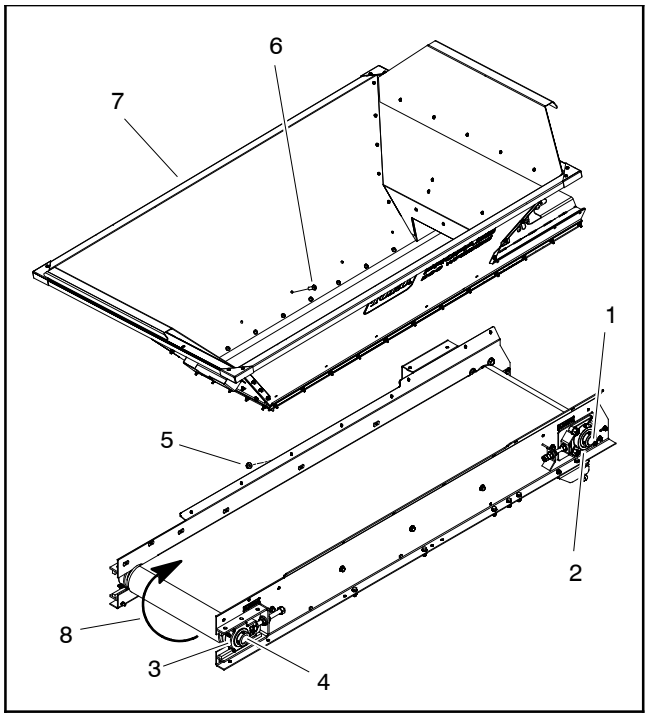

Figure 11

1. **Drive roller shaft**
2. **Drive roller bearing**
3. **Idler roller bearing**
4. **Idler roller shaft**
5. **Flange nut (16 used)**
6. **Screw (16 used)**
7. **Hopper assembly**
8. **Belt rotation direction**

Idler and Drive Rollers

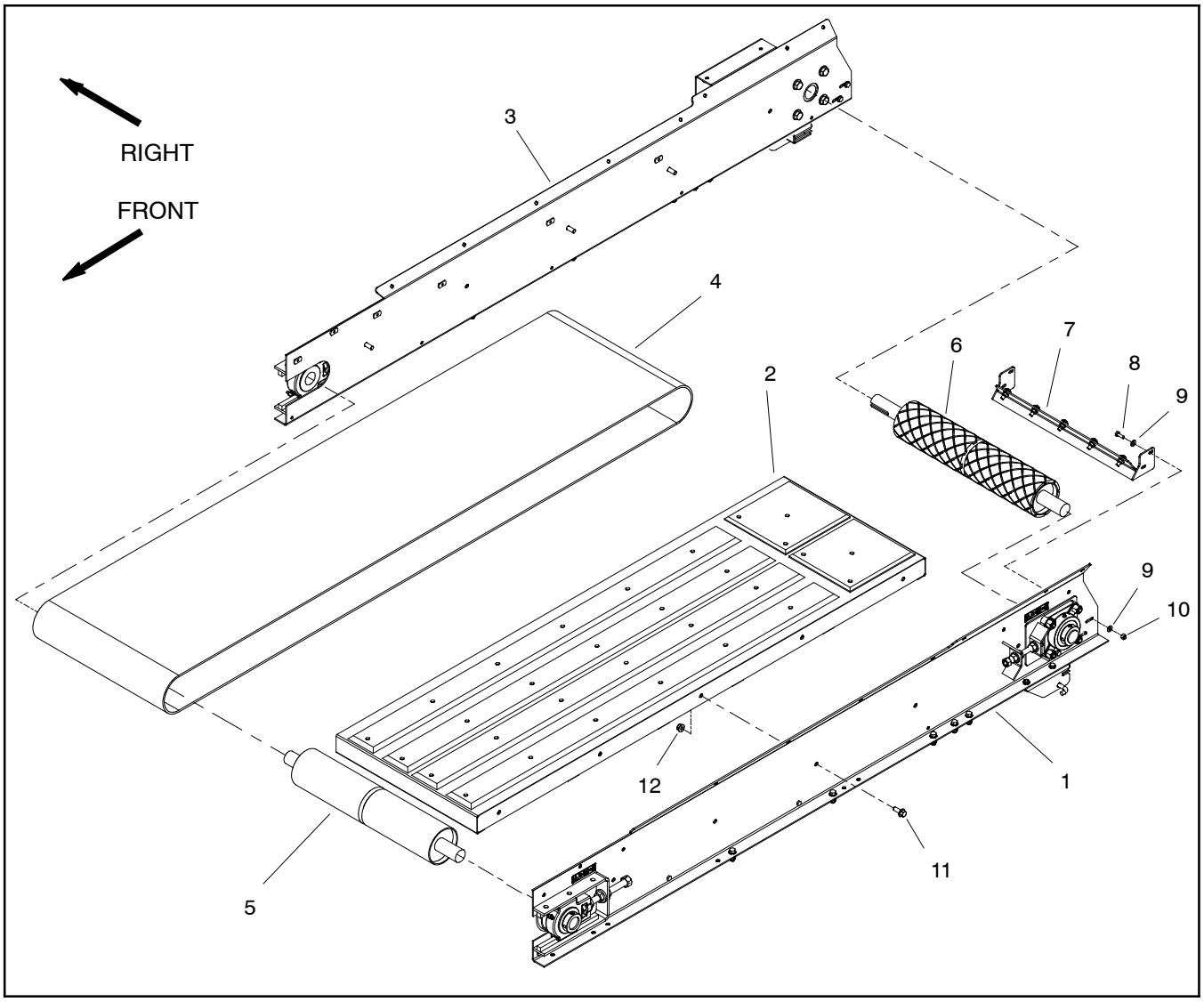

Figure 12

1. **LH conveyor frame assembly**
2. **Conveyor bed assembly**
3. **RH conveyor frame assembly**
4. **Floor conveyor belt**
5. **Idler roller**
6. **Drive roller**
7. **Scraper assembly**
8. **Cap screw (4 used)**
9. **Flat washer (8 used)**
10. **Lock nut (4 used)**
11. **Flange head screw (10 used)**
12. **Flange nut (10 used)**

To remove and replace the idler and drive rollers, removal of the left side conveyor frame and the floor conveyor belt is necessary. Once these items are removed, either roller can be removed from the bearing in the right side conveyor frame.

Removal (Fig. 12)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove left side conveyor frame and the floor conveyor belt (see Floor Conveyor Belt in this section).

3. If drive roller is to be removed:

   A. Remove drive chain and sprocket from drive roller (see Floor Motor Drive in this section).

   B. On right side conveyor frame, loosen bearing locking collar on drive roller shaft (see Drive Roller Bearings in this section).

   C. Slide drive roller from bearing and remove from machine.

4. If idler roller is to be removed:

   A. On right side conveyor frame, loosen bearing locking collar on idler roller shaft (see Idler Roller Bearings in this section).

   B. Slide idler roller from bearing and remove from machine.

Installation (Fig. 12)

IMPORTANT: During roller installation, do not lock bearing collars on idler and roller shafts until after both sides of conveyor frame are assembled and rollers are centered in the frame.

1. Insert removed roller into bearing on right side conveyor frame. Do not lock bearing collar or install set screw in collar at this time.

2. Install the floor conveyor belt and left side conveyor frame to machine (see Floor Conveyor Belt in this section). During assembly, make sure to center the rollers in the frame, to lock the bearing collars and to install set screws in collars on both sides of idler and drive roller bearings.

3. If drive roller was removed from right side conveyor frame, install sprocket and drive chain to drive roller (see Floor Motor Drive in this section).

4. Grease all four (4) bearings after installation is complete.

Idler Roller Take Up Bearings

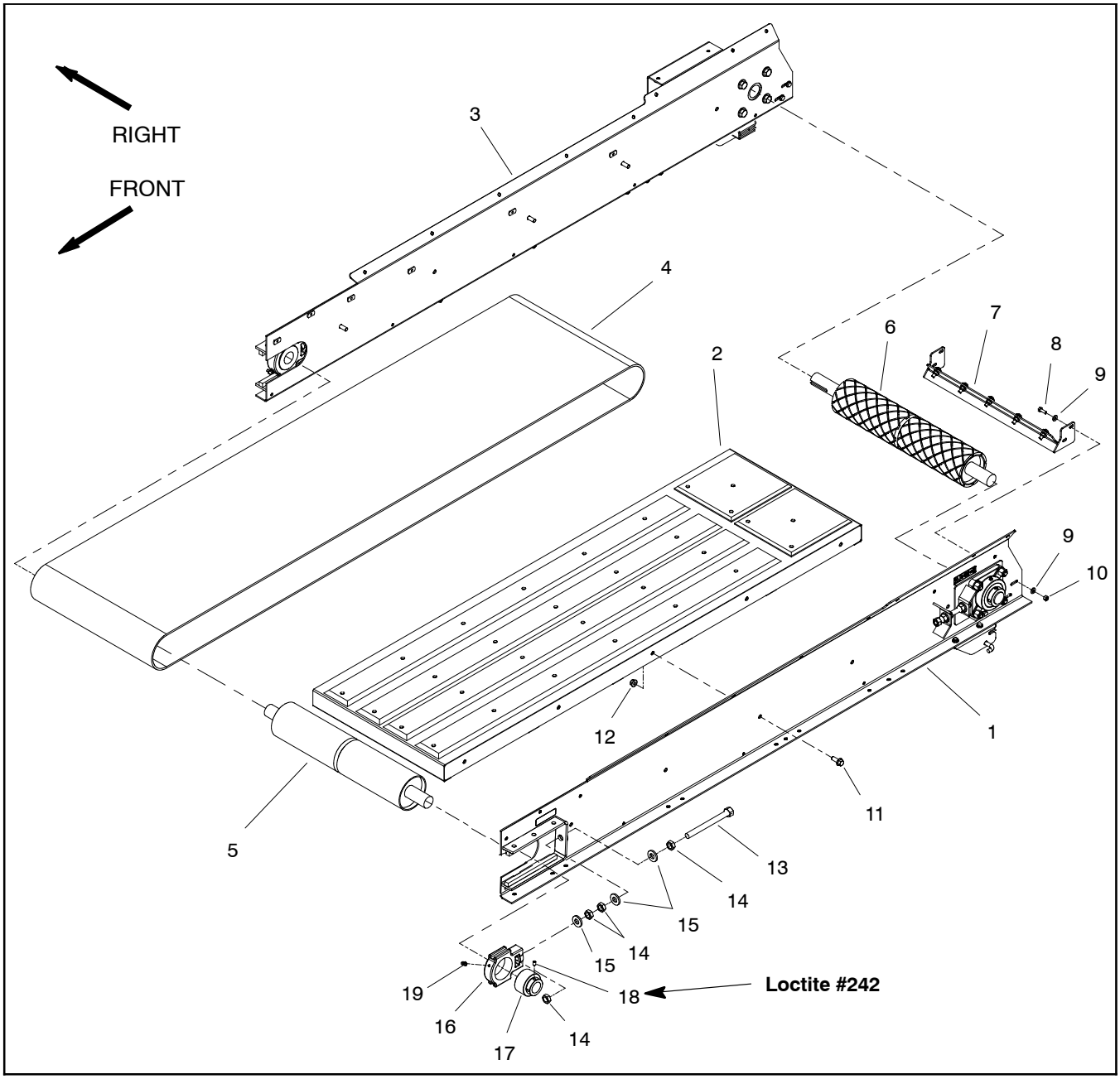

Figure 13

1. **LH conveyor frame assembly**
2. **Conveyor bed assembly**
3. **RH conveyor frame assembly**
4. **Floor conveyor belt**
5. **Idler roller**
6. **Drive roller**
7. **Scraper assembly**
8. **Cap screw (4 used)**
9. **Flat washer (8 used)**
10. **Lock nut (4 used)**
11. **Flange head screw (10 used)**
12. **Flange nut (10 used)**
13. **Tensioner rod**
14. **Jam nut**
15. **Flat washer**
16. **Take up bearing**
17. **Locking collar**
18. **Set screw**
19. **Grease fitting**

To remove and replace the idler roller take up bearings, removal of the left side conveyor frame and the floor conveyor belt is necessary. Once these items are removed, access to the left side take up bearing is possible. The idler roller needs to be removed from the right side take up bearing before the right side bearing can be removed from the frame.

Disassembly (Fig. 13)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Remove left side conveyor frame and the floor conveyor belt (see Floor Conveyor Belt in this section).

3. If right side idler roller take up bearing is to removed, remove idler roller from right side conveyor frame (see Idler and Drive Rollers in this section).

4. Remove take up bearings from frame using Figure 13 as a guide.

Assembly (Fig. 13)

1. Apply antiseize lubricant to the grooves of the take up bearing before installing the bearing to the channels of the conveyor frame.

2. Install take up bearing to frame using Figure 13 as a guide. Do not tighten locking or adjusting jam nuts until conveyor belt is properly adjusted.

3. If idler roller was removed, insert idler roller into take up bearing on right side conveyor frame. Do not lock bearing collar or install set screw in collar at this time.

4. Install the floor conveyor belt and left side conveyor frame to machine (see Floor Conveyor Belt in this section). During assembly, make sure to center the rollers in the frame, to lock the bearing collars and to install set screws in collars on both sides of idler and drive roller bearings.

5. Grease all four (4) bearings after assembly is complete.

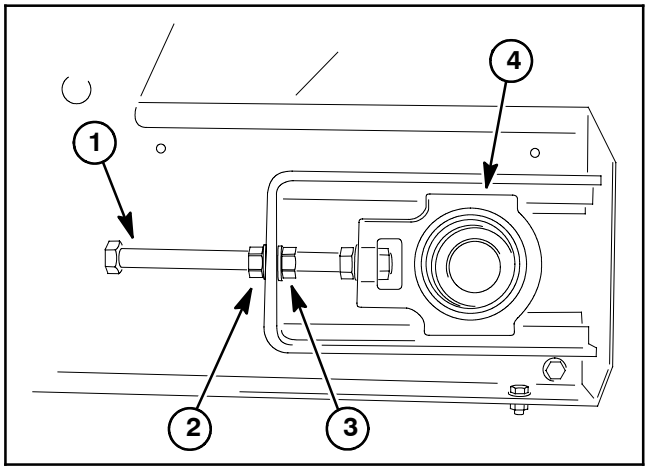

Figure 14

1. **Tensioner rod**
2. **Locking jam nut**
3. **Adjusting jam nut**
4. **Take up bearing**

Wheel Assemblies (Tow Chassis)

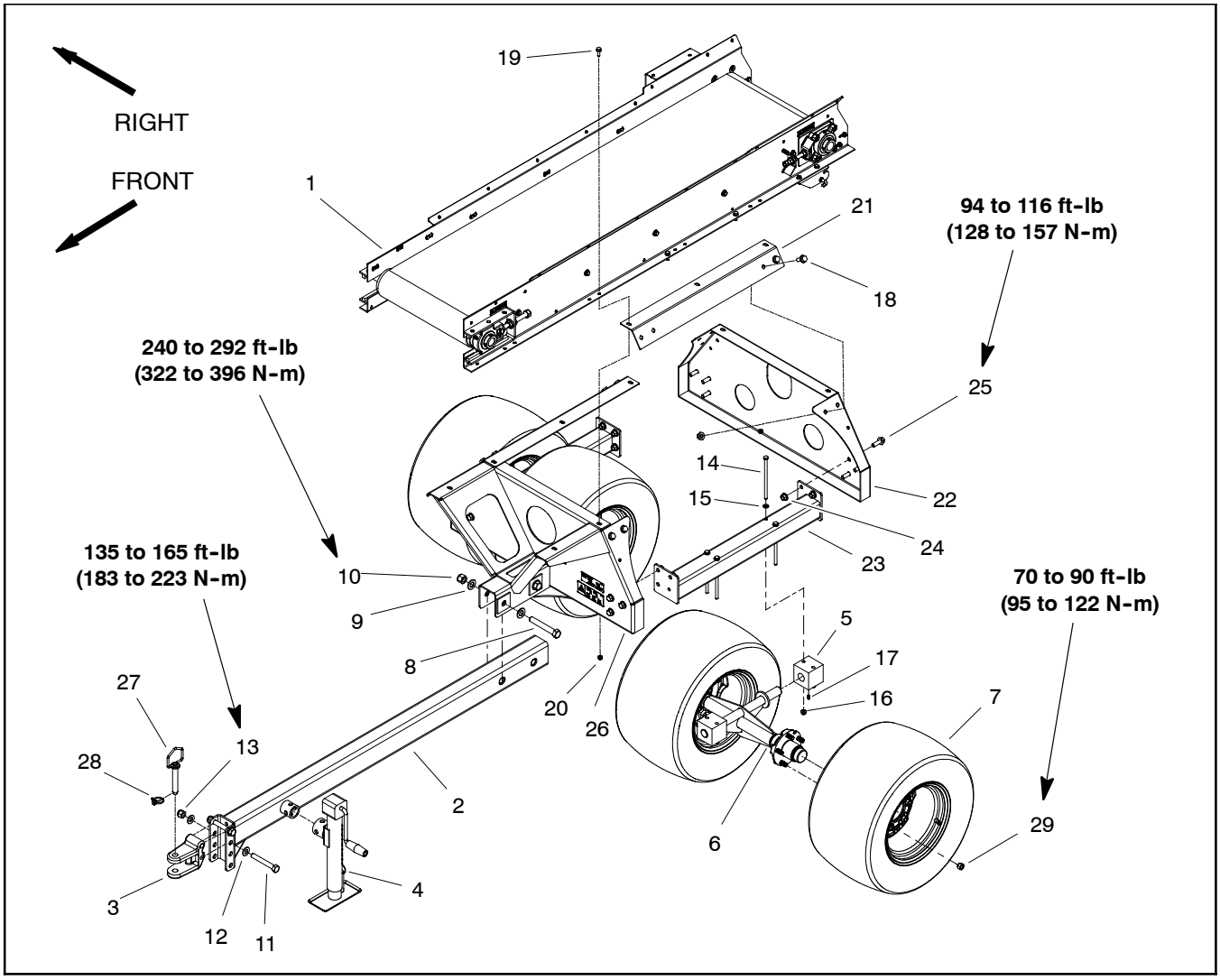

Figure 15

1. Floor assembly
2. Hitch
3. Hitch clevis
4. Jack
5. Walking beam bearing (4 used)
6. Walking beam assembly (2 used)
7. Wheel assembly (4 used)
8. Cap screw (2 used)
9. Flat washer (4 used)
10. Lock nut (2 used)
11. Cap screw (2 used)
12. Flat washer (4 used)
13. Lock nut (2 used)
14. Cap screw (8 used)
15. Flat washer (8 used)
16. Flange nut (8 used)
17. Grease fitting (4 used)
18. Flange head screw (8 used)
19. Flange head screw (6 used)
20. Flange nut (6 used)
21. Top cross member (2 used)
22. Frame brace
23. Cross member (2 used)
24. Lock nut (20 used)
25. Flange head screw (12 used)
26. Front brace
27. Hitch pin
28. Lynch pin
29. Lug nut (5 used per wheel)

NOTE: The outer wheels can be removed with the walking beam (item 6) attached to the ProPass machine. If an inner wheel needs to be removed, walking beam removal is necessary (see Walking Beam Assembly in this section).

Wheel Removal (Fig. 15)

1. Position ProPass on a level surface attached to towing vehicle. Apply vehicle parking brake, stop engine and remove key from the ignition switch. Chock ProPass wheels to prevent machine from moving.

2. Jack or hoist ProPass from ground and support machine with appropriate jack stands.

3. If removal of inner wheel assemblies is necessary, remove walking beam assembly from machine (see Walking Beam Assembly in this section).

4. Loosen and remove five (5) lug nuts from wheel to be removed.

5. Pull wheel from walking beam assembly.

Wheel Installation (Fig. 15)

1. Position wheel to wheel hub.

2. Secure wheel to wheel hub with five (5) lug nuts.

WARNING

Failure to maintain proper lug nut torque could result in failure or loss of wheel and may result in personal injury.

3. Torque lug nuts in a criss−cross pattern from **70 to 90 ft−lb (95 to 122 N−m)**.

4. If removed, install walking beam assembly to machine (see Walking Beam Assembly in this section).

5. Carefully lower machine to ground.

Wheel Bearing Service (Tow Chassis)

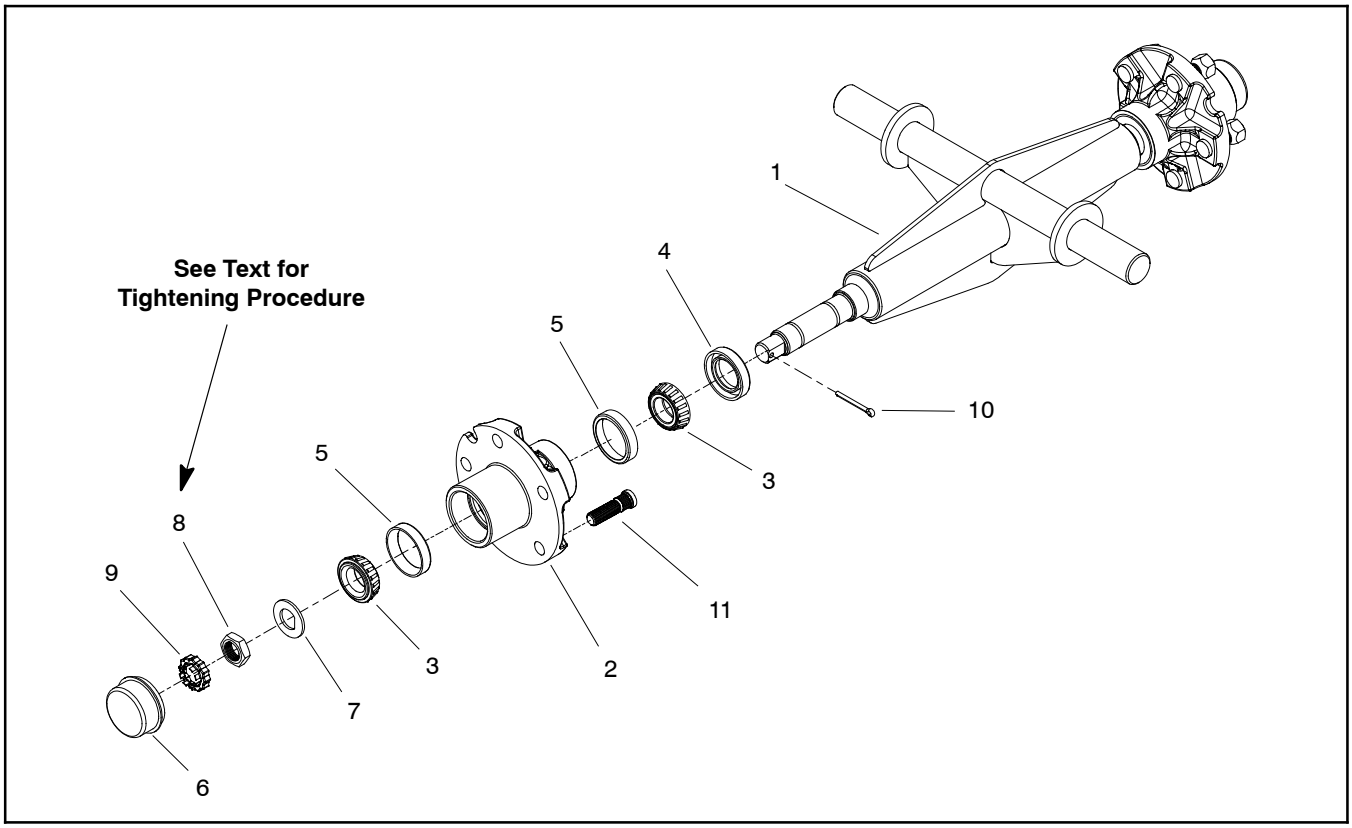

Figure 16

1. **Walking beam axle**
2. **Hub (2 used per axle)**
3. **Bearing cone (2 used per hub)**
4. **Seal**
5. **Bearing cup (2 used per hub)**
6. **Dust cap**
7. **Spindle washer**
8. **Spindle nut**
9. **Nut retainer**
10. **Cotter pin**
11. **Wheel stud (5 used per hub)**

NOTE: The outer hub and wheel bearings can be removed with the walking beam attached to the ProPass machine. If the inner hub needs to be removed, walking beam removal is necessary (see Walking Beam Assembly in this section).

Removal (Fig. 16)

1. Position ProPass on a level surface attached to towing vehicle. Apply vehicle parking brake, stop engine and remove key from the ignition switch. Chock ProPass wheels to prevent machine from moving.

2. Jack or hoist ProPass from ground and support machine with appropriate jack stands.

3. If inner wheel bearings are to be serviced, remove walking beam from machine (see Walking Beam Assembly in this section).

4. Remove wheel assembly (see Wheel Assemblies in this section).

5. Carefully pry dust cap from wheel hub.

6. Remove cotter pin from axle spindle.

7. Remove nut retainer, spindle nut and spindle washer that secure wheel hub to spindle. Slide wheel hub with bearings from spindle.

8. Disassemble wheel hub:

   A. Pull seal out of the wheel hub. Discard seal.

   B. Remove bearing cones from both sides of wheel hub. Clean bearings in solvent. Clean inside of hub.

   C. If necessary, remove bearing cups from hub using a hammer and punch. Take care to not damage hub as bearing cups are removed.

   D. Inspect wheel bearings. Check the bearing cones and bearing cups for wear, pitting or other damage. Replace worn or damaged parts.

   E. If necessary, use a press to remove wheel studs from hub.

Installation (Fig. 16)

1. Clean all parts thoroughly before reassembly.

2. Assemble wheel hub onto the same spindle from which it was removed:

   A. If bearing cups were removed from the wheel hub, press inner and outer cups into the hub until they seat against the hub shoulder.

   B. If wheel studs were removed from hub, press new studs into hub. Make sure that head of stud is fully to hub surface.

   C. Pack both bearing cones with grease. Install greased inner bearing into the cup on inboard side of the wheel hub.

   D. Fill hub approximately 50% full of grease.

   IMPORTANT: The seal must be pressed in so it is flush with the end of the hub. The lip of the seal must face the bearing.

   E. Lubricate the inside of a new seal and press it into the wheel hub.

3. Install the wheel hub onto the axle spindle taking care to not damage seal in wheel hub.

4. Install greased outer bearing cone, spindle washer and spindle nut onto spindle shaft. DO NOT fully tighten the nut or install the cotter pin.

IMPORTANT: Most wheel bearing failures can be attributed to improper bearing adjustment, normally due to the bearings being adjusted too tight. Follow the following adjustment process to prevent premature bearing problems.

5. Adjust wheel bearings as follows:

   A. While rotating the wheel hub by hand, torque the spindle nut from **75 to 100 in-lb (8.5 to 11.3 N-m)** to set the bearings. Then, loosen the nut until the hub has endplay.

   B. Again, while rotating the wheel hub by hand, torque the spindle nut from **15 to 20 in-lb (1.7 to 2.3 N-m)**. After tightening, make sure that the wheel hub does not have any free play.

   C. Install nut retainer with slot aligned to cotter pin hole in spindle. Install cotter pin.

6. Fill dust cap approximately half full of grease. Install dust cap.

WARNING

Failure to maintain proper lug nut torque could result in failure or loss of wheel and may result in personal injury.

7. Install wheel assembly (see Wheel Assemblies in this section). Make sure that lug nuts are torqued in a criss-cross pattern from **70 to 90 ft-lb (95 to 122 N-m)**.

8. If removed, install walking beam assembly to machine (see Walking Beam Assembly in this section).

9. Carefully lower machine to ground.

Walking Beam Assembly (Tow Chassis)

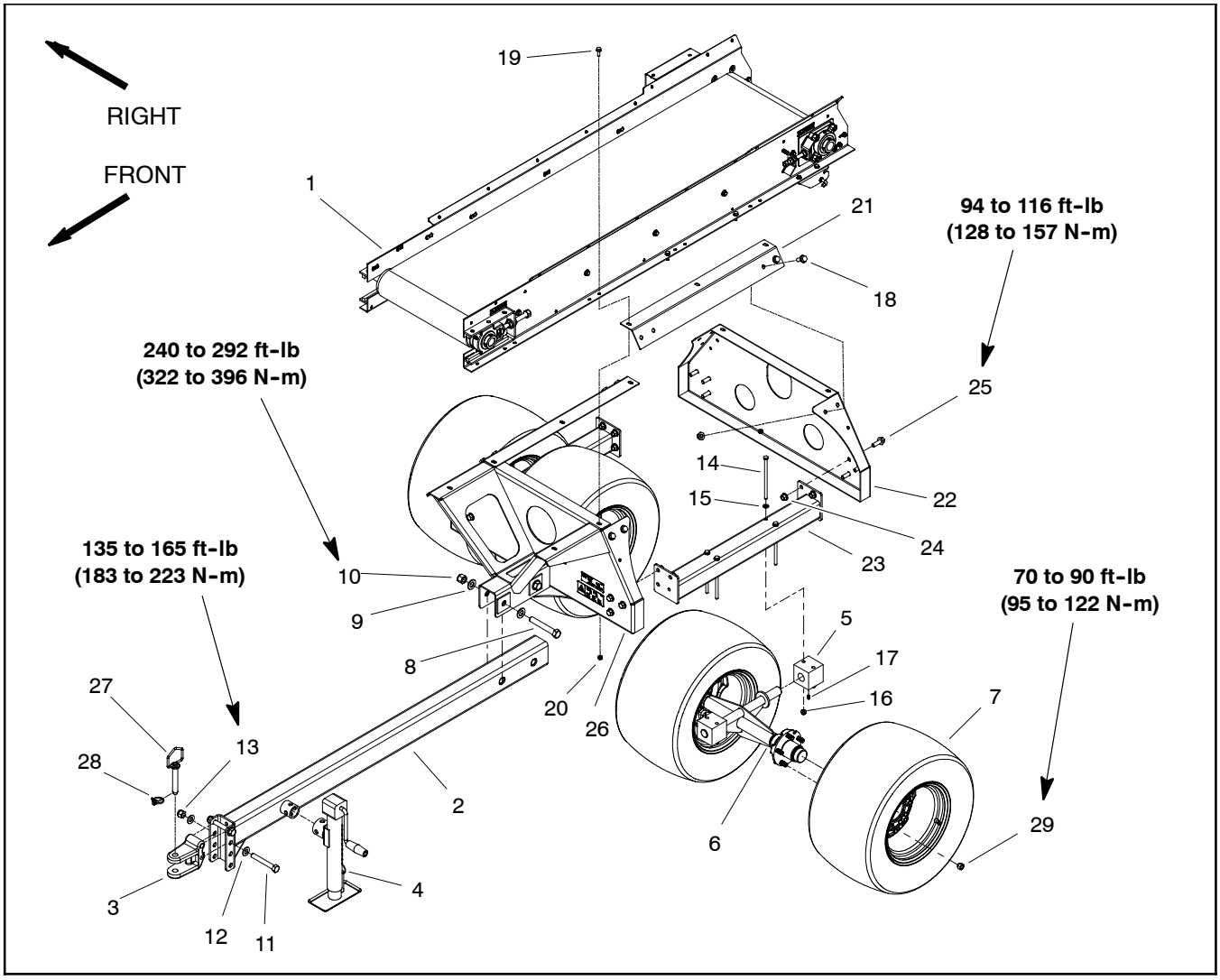

Figure 17

1. Floor assembly
2. Hitch
3. Hitch clevis
4. Jack
5. Walking beam bearing (4 used)
6. Walking beam assembly (2 used)
7. Wheel assembly (4 used)
8. Cap screw (2 used)
9. Flat washer (4 used)
10. Lock nut (2 used)
11. Cap screw (2 used)
12. Flat washer (4 used)
13. Lock nut (2 used)
14. Cap screw (8 used)
15. Flat washer (8 used)
16. Flange nut (8 used)
17. Grease fitting (4 used)
18. Flange head screw (8 used)
19. Flange head screw (6 used)
20. Flange nut (6 used)
21. Top cross member (2 used)
22. Frame brace
23. Cross member (2 used)
24. Lock nut (20 used)
25. Flange head screw (12 used)
26. Front brace
27. Hitch pin
28. Lynch pin
29. Lug nut (5 used per wheel)

Removal (Fig. 17)

1. Position ProPass on a level surface attached to towing vehicle. Apply vehicle parking brake, stop engine and remove key from the ignition switch. Chock ProPass wheels to prevent machine from moving.

2. Jack or hoist ProPass from ground and support machine with appropriate jack stands.

CAUTION

To prevent personal injury and machine damage, make sure that walking beam assembly is properly supported as it is removed from the machine. Walking beam assembly (including wheel assemblies) weighs approximately 130 pounds (59 kg).

3. Support walking beam assembly to prevent it from shifting during removal.

4. Remove cap screws, flat washers and flange nuts that secure walking beam bearings to frame cross member.

5. Carefully lower walking beam assembly and remove from machine.

6. Clean bearings and pivot areas of walking beam.

Installation (Fig. 17)

1. Slide bearings onto walking beam pivots. Position walking beam assembly under machine. Make sure that grease fittings in bearings are orientated toward the ground.

2. Carefully raise walking beam assembly and align bearings with frame cross member.

3. Secure walking beam bearings to cross member with cap screws, flat washers and flange nuts.

4. Carefully lower machine to ground.

5. Grease walking beam bearings.

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Chapter 6

Hydraulic Power Pack

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Power Pack Engine Specifications

Item	Description
Make / Designation	Honda Model GX340 4–Cycle, OHV, Gasoline Engine
Bore	3.465” (88 mm)
Stroke	2.520” (64 mm)
Total Displacement	23.7 in^3 (389 cc)
Direction of Rotation	Counterclockwise (viewed from PTO end)
Fuel	Regular Unleaded Gasoline with less than 10% Ethanol
Fuel Capacity	6.4 U.S. Quarts (6.1 Liters)
Governor	Centrifugal Mechanical
Low Idle (no load)	1400 RPM
High Idle (no load)	3750 RPM
Engine Oil	API SJ or higher
Engine Oil Viscosity	See Operator’s Manual
Crankcase Oil Capacity	1.2 U.S. Quarts (1.1 Liters)
Starter	12 VDC
Alternator/Regulator Alternator Output	12 VDC 18 amp
Engine Dry Weight	84 U.S. pounds (38 kg)

NOTE: The Honda engine included with the ProPass Power Pack is equipped with a low oil shutdown system that disables the ignition system if the oil level should fall below the safe limit.

Power Pack Hydraulic Specifications

Item	Description
Gear Pump Displacement (per revolution)	Eaton gear pump (Model 26001) 0.40 in^3 (6.6 cc)
Circuit Relief Pressure	2000 PSI (138 bar)
Hydraulic Tank Capacity	8.7 U.S. Gallons (32.9 Liters)
Hydraulic Oil	See Power Pack Installation Instructions
Hydraulic Filter	Spin-on cartridge type

General Information

This Chapter gives information about specifications and repair of the engine and hydraulic components used in the ProPass Hydraulic Power Pack assembly.

General maintenance procedures are described in your Traction Unit Operator's Manual.

Information on engine troubleshooting, testing, disassembly and assembly is identified in the Honda Workshop Manual that is available from Honda. Most engine repairs and adjustments require tools which are commonly available in many service shops. Special tools are described in the Honda Workshop Manual. The cost of the test equipment and the specialized nature of some repairs may dictate that engine work be done at an engine repair facility.

Some service and repair parts for the Honda engine in the Power Pack assembly are supplied through your Authorized TORO Distributor. If no parts list is available, be prepared to provide your distributor with the Toro model and serial number.

Engine Owner's Manual

The engine Owner's Manual provides information regarding the operation, general maintenance and maintenance intervals for the Honda GX340 engine on your ProPass Hydraulic Power Pack assembly. Refer to this publication for additional information when servicing the engine.

Installation Instructions

The Installation Instructions provides information regarding the operation, general maintenance and maintenance intervals for the Hydraulic Power Pack assembly on your ProPass machine. Refer to this publication for additional information when servicing the machine.

Parts Catalog

The Parts Catalog can be used to provide general disassembly and assembly information for the Hydraulic Power Pack assembly on your ProPass machine. Refer to this publication for additional information when servicing the machine.

Hydraulic Schematics

The hydraulic schematics for ProPass machines equipped with the Hydraulic Power Pack assembly are included in Chapter 4 – Hydraulic System.

Electrical System Quick Checks

Battery Test (Open Circuit Test)

Use a multimeter to measure the voltage between the battery terminals.

Set multimeter to the DC volts setting. The battery should be at a temperature of 60º to 100ºF (16º to 38ºC). The ignition key should be off and all accessories turned off. Connect the positive (+) meter lead to the positive battery post and the negative (–) meter lead to the negative battery post.

NOTE: This test provides a relative condition of the battery. Load testing of the battery will provide additional and more accurate information (see Battery Service in the Service and Repairs section of this chapter).

Voltage Measured	Battery Charge Level
12.68 V (or higher)	Fully charged (100%)
12.45 V	75% charged
12.24 V	50% charged
12.06 V	25% charged
11.89 V	0% charged

Charging System Test

This is a simple test used to determine if a charging system is functioning. It will tell you if the charging system has an output, but not its capacity.

Use a digital multimeter set to DC volts. Connect the positive (+) multimeter lead to the positive battery post and the negative (–) multimeter lead to the negative battery post. Keep the test leads connected to the battery posts and record the battery voltage.

NOTE: Upon starting the engine, the battery voltage will drop and then should increase once the engine is running.

NOTE: Depending upon the condition of the battery charge and battery temperature, the battery voltage will increase at different rates as the battery charges.

Start the power pack engine and run at high idle **(3750 RPM)**. Allow the battery to charge for at least three (3) minutes. Record the battery voltage.

After running the engine for at least three (3) minutes, battery voltage should be at least 0.50 volt higher than initial battery voltage.

An example of a charging system that is functioning:

At least 0.50 volt over initial battery voltage.	
Initial Battery Voltage	= 12.30 v
Battery Voltage after 3 Minute Charge	= 12.85 v
Difference	= +0.55 v

Adjustments

Adjust Manifold Relief Valve

The hydraulic relief valve manifold includes an adjustable relief valve for system relief (Fig. 1). If adjustment to this valve is necessary, follow the following procedure.

NOTE: Do not remove relief valve from the hydraulic manifold for adjustment.

WARNING

Never adjust the relief valve with the hydraulic system pressurized. Hydraulic oil may spray out of the valve with the cap off. Personal injury may result. Always install the cap and tighten before pressurizing the system.

1. Locate relief valve on control manifold.

2. Loosen jam nut on relief valve to allow adjustment on the valve.

3. To **increase** pressure setting, turn the adjustment socket on the valve in a clockwise direction. A 1/8 turn on the socket will make a measurable change in relief pressure.

4. To **decrease** pressure setting, turn the adjustment socket on the valve in a counterclockwise direction. A 1/8 turn on the socket will make a measurable change in relief pressure.

5. Tighten jam nut on relief valve.

6. Recheck relief pressure and readjust as needed. If adjustments to the relief valve do not change the relief pressure, consider that the relief valve cartridge is leaking or damaged.

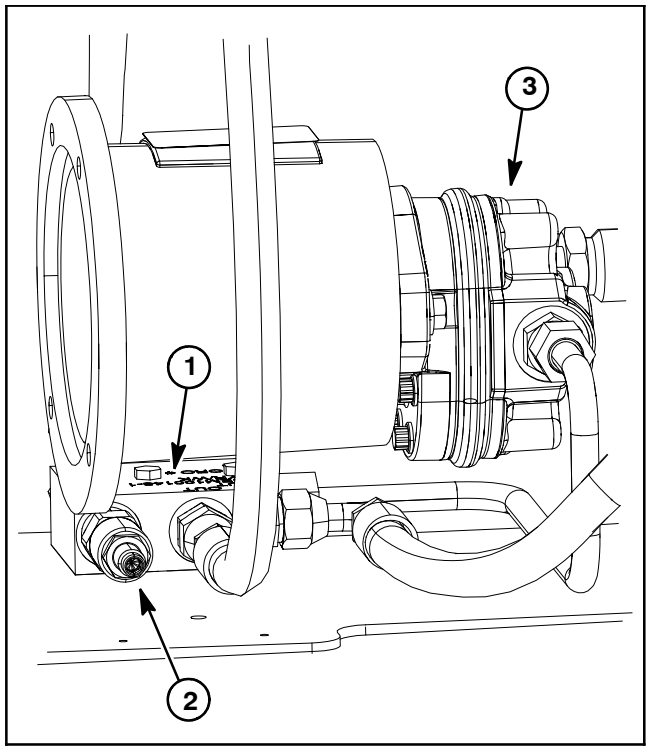

Figure 1

1. **Relief valve manifold**
2. **Relief valve**
3. **Gear pump**

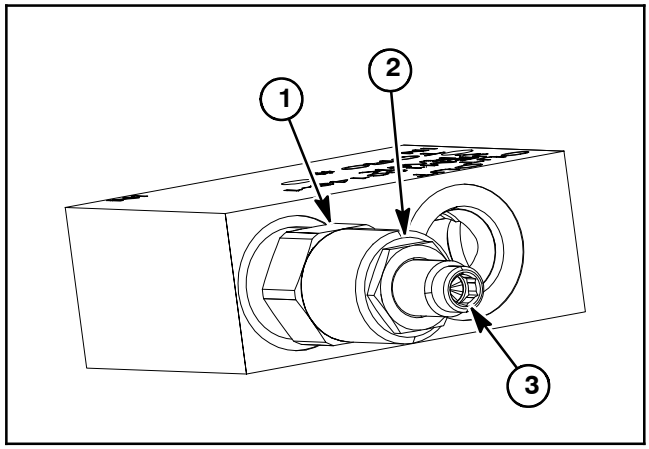

Figure 2

1. **Relief valve cartridge**
2. **Jam nut**
3. **Adjustment socket**

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Hydraulic Testing

The most effective method for isolating problems in the hydraulic system is by using hydraulic test equipment such as pressure gauges and flow meters in the circuits during various operational checks. Information regarding special tools for hydraulic testing is in the Special Tools section of Chapter 3 – Hydraulic System.

IMPORTANT: To prevent possible personal injury or machine damage when conducting hydraulic tests, review the Precautions for Hydraulic Testing in the Testing section of Chapter 3 – Hydraulic System.

Combined Hydraulic Power Pack Gear Pump Flow and System Relief Pressure Tests (Using Tester with Flowmeter and Pressure Gauge)

The power pack gear pump flow test should be performed to make sure that the ProPass hydraulic circuits have adequate hydraulic flow and the system relief pressure test identifies if the relief valve adjustment is correct. These hydraulic tests can be done with the same tester connections as described below.

Procedure for the Combined Power Pack Gear Pump Flow and System Relief Pressure Tests:

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately ten (10) minutes.

2. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving. Make sure that key switch on power pack engine is in the OFF position. Also, make sure the hydraulic tank is full.

CAUTION

Prevent personal injury and/or damage to equipment. Read all WARNINGS, CAUTIONS and Precautions for Hydraulic Testing in the Testing section of Chapter 3 – Hydraulic System.

3. Thoroughly clean junction of hydraulic supply hose and relief valve manifold fitting on right side of manifold (Fig. 3). Disconnect supply hose from manifold fitting.

4. Install hydraulic tester (pressure and flow) in series with the disconnected hose and the manifold fitting. Make sure that tester flow arrow points from the manifold fitting and toward the disconnected hose. **Also, make sure flow control valve on the tester is fully open.**

5. Make sure that ProPass controls for the floor and the twin spinner are disengaged.

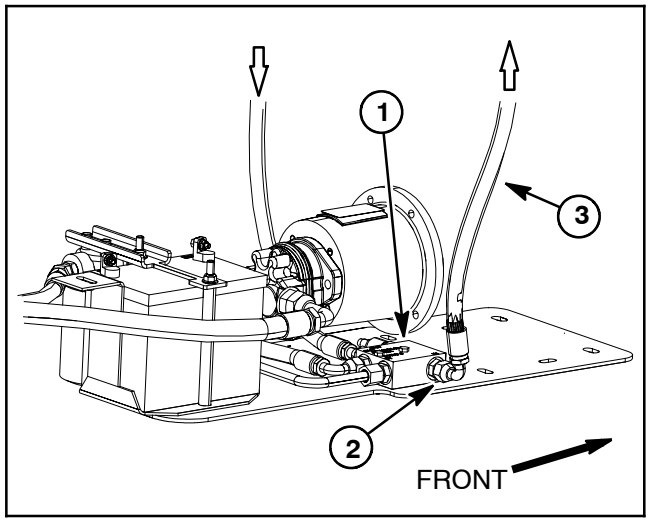

Figure 3

1. **Relief valve manifold**
2. **Fitting**
3. **Hydraulic supply hose**

6. Start power pack engine and run at low idle speed. Check for hydraulic leakage at tester connections and correct before proceeding with test.

7. Move throttle so engine is running at high idle speed **(3750 RPM)**.

8. Watch tester flow and pressure gauges carefully while slowly closing the flow control valve on the tester until the pressure gauge reads **800 PSI (55 bar)**.

9. Monitor the flow gauge to determine the gear pump output (GPM/LPM). When gear pump output has been determined, open control valve on tester, move throttle to low idle speed and shut off engine. Record flow gauge test results.

10. Flow gauge reading for a gear pump in good condition should be approximately **6.0 GPM (22.7 LPM)**.

11. If gear pump flow is less than **5.2 GPM (19.7 LPM)**, check system relief valve for possible leakage as follows:

A. Leave hydraulic tester (pressure and flow) installed as listed above. Make sure flow control valve on tester is fully open.

B. Start power pack engine and run at high idle speed **(3750 RPM)**.

IMPORTANT: Close flow control valve on tester only enough to get a system relief pressure reading.

IMPORTANT: Do not fully restrict oil flow through tester. In this test, the flow tester is positioned before the relief valve. Pump damage can occur if the oil flow is fully restricted.

C. Watch pressure gauge carefully while slowly closing the tester flow control valve until the relief valve opens.

D. System pressure should be approximately **2000 PSI (138 bar)** as the relief valve lifts.

E. When relief valve pressure has been determined, open control valve on tester, move throttle to low idle speed and shut off engine. Record relief valve pressure test results.

F. If relief valve pressure needs adjustment, see Adjust Manifold Relief Valve in the Adjustments section of this chapter. If adjustments to the relief valve do not change the relief pressure, consider that the relief valve cartridge is leaking or damaged which may also affect the gear pump flow measured above.

12. If gear pump flow reading (from step 10 above) is low and relief valve operation is normal:

A. Check gear pump suction line for restriction.

B. Check gear pump flow at gear pump fitting (see Hydraulic Power Pack Gear Pump Flow in this section).

13. When testing is complete, disconnect tester from the hydraulic hose and manifold fitting. Reconnect hose to manifold fitting.

Hydraulic Power Pack Gear Pump Flow (Using Tester with Flowmeter and Pressure Gauge)

The power pack gear pump flow test listed below should be performed after first determining that the system relief valve is operating correctly (see Hydraulic Power Pack Gear Pump Flow and System Relief Pressure Tests in this section). The following procedure is used to identify the gear pump flow directly from the pump outlet.

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately ten (10) minutes.

2. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving. Make sure that key switch on power pack engine is in the OFF position. Also, make sure the hydraulic tank is full.

CAUTION

Prevent personal injury and/or damage to equipment. Read all WARNINGS, CAUTIONS and Precautions for Hydraulic Testing in the Testing section of Chapter 3 - Hydraulic System.

3. Thoroughly clean junction of both ends of hydraulic tube and fittings on gear pump and relief valve manifold (Fig. 4). Disconnect tube from both pump fitting and manifold fitting. Then, remove hydraulic tube.

4. Install hydraulic tester (pressure and flow) in series between the gear pump fitting and the manifold fitting. Make sure that tester flow arrow points from the gear pump fitting and toward the manifold. **Also, make sure flow control valve on the tester is fully open.**

5. Make sure that ProPass controls for the floor and the twin spinner are disengaged.

6. Start power pack engine and run at low idle speed. Check for hydraulic leakage at tester connections and correct before proceeding with test.

7. Move throttle so engine is running at high idle speed **(3750 RPM)**.

8. Watch tester flow and pressure gauge carefully while slowly closing the flow control valve on the tester until the pressure gauge reads **800 PSI (55 bar)**.

9. Monitor the flow gauge to determine the gear pump output (GPM/LPM). When gear pump output has been determined, open control valve on tester, move throttle to low idle speed and shut off engine. Record flow gauge test results.

10. Flow gauge reading for a gear pump in good condition should be approximately **6.0 GPM (22.7 LPM)**.

11. If gear pump flow is less than **5.2 GPM (19.7 LPM)** or a pressure of **800 PSI (55 bar)** cannot be obtained, check for restriction in the pump intake line. If line is not restricted, remove gear pump and repair or replace as necessary.

12. When testing is complete, disconnect tester from the gear pump fitting and the manifold fitting. Reconnect hydraulic tube to gear pump and manifold fittings.

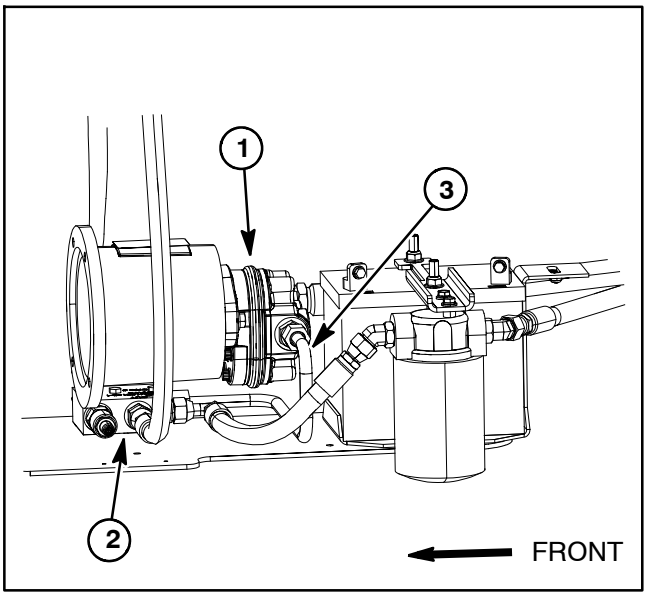

Figure 4

1. **Gear pump**
2. **Relief valve manifold**
3. **Hydraulic tube**

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Engine

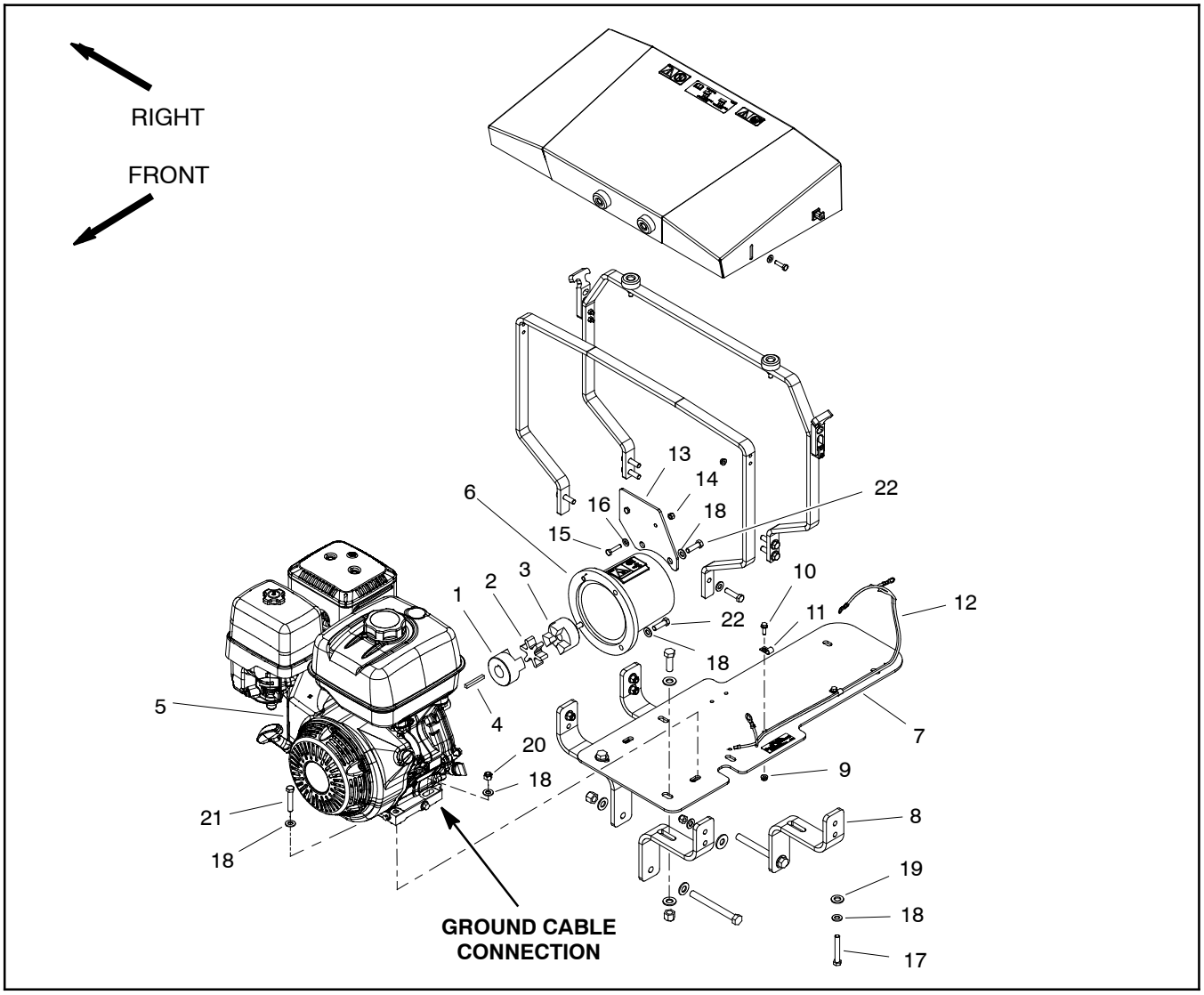

Figure 5

1. Jaw coupling (engine)
2. Spider coupling
3. Jaw coupling (gear pump)
4. Square key
5. Engine
6. Flange adapter
7. Engine mount plate
8. Mount bracket (4 used)
9. Flange nut (2 used)
10. Cap screw (2 used)
11. R-clamp (2 used)
12. Engine wire harness
13. Generator bracket
14. Lock nut (2 used)
15. Cap screw (2 used)
16. Flat washer (2 used)
17. Cap screw (2 used)
18. Flat washer (10 used)
19. Flat washer (2 used)
20. Lock nut (4 used)
21. Cap screw (2 used)
22. Cap screw (4 used)

Engine Removal (Fig. 5)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. To prevent unexpected machine operation, disconnect the negative battery cable from the battery terminal. Position disconnected negative cable away from the negative battery terminal.

CAUTION

The engine and exhaust system may be hot. Avoid possible burns: allow engine to cool before removing the engine.

3. If engine is to be disassembled, it may be easier to drain oil from engine before removing engine from machine.

4. Disconnect positive cable from starter solenoid terminal.

5. Support gear pump to prevent it from moving as engine is removed from machine. Remove two (2) cap screws and flat washers that secure gear pump to flange adapter (Fig. 6).

NOTE: Ground cable is secured with engine mounting screw under starter motor.

6. Remove four (4) cap screws, flat washers and lock nuts that secure engine to mount plate. Note location of ground cable, cap screws and washers for assembly purposes.

CAUTION

To prevent personal injury, make sure that engine is properly supported as it is removed from the machine. Engine assembly (including flange adapter) weighs approximately 100 pounds (46 kg).

7. Carefully slide engine assembly (with flange adapter attached) away from gear pump until the pump jaw coupling disengages from the spider coupling. Remove engine assembly from machine.

8. If necessary, loosen set screw in jaw coupling on engine shaft and slide coupling from shaft. Locate and retrieve square key.

9. Remove engine parts and attachments as necessary to repair the engine.

Engine Installation (Fig. 5)

1. Position machine on a level surface.

2. Make sure that all parts removed from the engine during maintenance or rebuilding are properly installed to the engine.

3. If jaw coupling was removed from engine shaft, apply antiseize lubricant to shaft. Insert square key into shaft keyway and then slide jaw coupling onto shaft. Align jaw coupling flush with the end of the shaft and secure with set screw.

4. Position engine (with flange adapter attached) onto machine frame. Make sure that spider coupling is positioned into coupling jaw on engine shaft.

5. Carefully slide engine assembly toward the gear pump until the pump jaw coupling engages the spider coupling.

6. Secure gear pump to flange adapter with two (2) cap screws and flat washers (Fig. 6).

NOTE: Make sure that ground cable is secured with engine mounting screw under starter motor.

7. Install four (4) cap screws, flat washers and lock nuts through the mount plate and engine mounting holes. Secure ground cable with cap screw on starter motor side of engine closest to shaft side of engine. Tighten fasteners to secure engine to mount plate.

8. Check and adjust engine oil level as needed.

NOTE: If engine oil level is low, engine will not run.

9. Connect positive cable to starter solenoid terminal.

10. Connect negative battery cable to negative battery terminal.

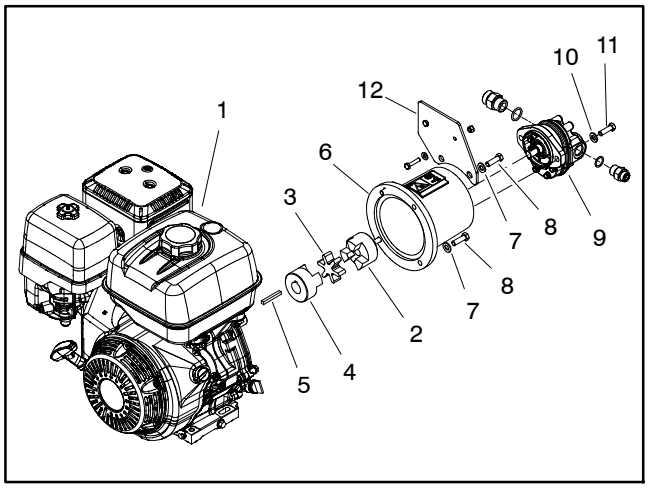

Figure 6

1. **Engine**
2. **Pump jaw coupling**
3. **Spider coupling**
4. **Engine jaw coupling**
5. **Square key**
6. **Flange adapter**
7. **Flat washer**
8. **Cap screw**
9. **Gear pump**
10. **Flat washer (2 used)**
11. **Cap screw (2 used)**
12. **Generator bracket**

Power Pack Hydraulic Tank

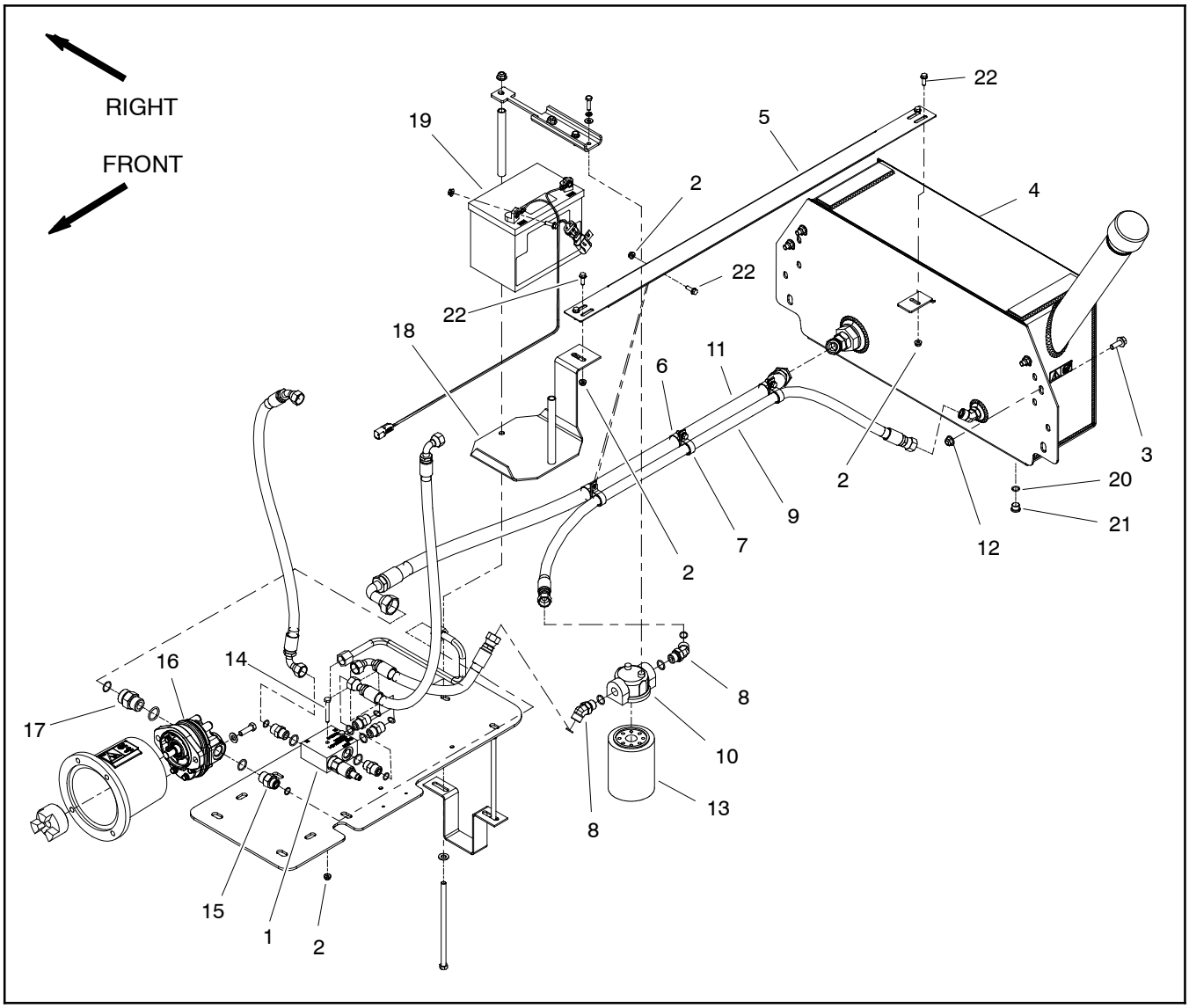

Figure 7

1. **Hydraulic relief valve manifold**
2. **Flange nut (9 used)**
3. **Flange head screw (4 used)**
4. **Hydraulic tank assembly**
5. **Hose bracket**
6. **R-clamp (3 used)**
7. **R-clamp (3 used)**
8. **45º hydraulic fitting (2 used)**
9. **Hydraulic hose**
10. **Filter head**
11. **Hydraulic hose**
12. **Flange nut (4 used)**
13. **Oil filter**
14. **Cap screw (2 used)**
15. **Straight hydraulic fitting**
16. **Hydraulic gear pump**
17. **Straight hydraulic fitting**
18. **Battery tray**
19. **Battery**
20. **O-ring**
21. **#6 plug**
22. **Flange head screw (7 used)**

Removal (Fig. 7)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Read the General Precautions for Removing and Installing Hydraulic System Components in the Service and Repairs section of Chapter 3 – Hydraulic System.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of Chapter 3 – Hydraulic System.

3. Remove twin spinner (or other option) from machine.

4. Thoroughly clean junction of hydraulic lines and hydraulic tank fittings. Disconnect hydraulic lines from tank. Install caps or plugs in hose and tank fittings to prevent contamination and leakage of hydraulic oil.

5. Place a suitable container under the hydraulic tank to collect hydraulic oil. Remove plug (item 21) from bottom of tank and drain hydraulic tank. Discard O-ring from plug.

6. Disconnect hoses from the hydraulic fittings in tank. Allow hoses to drain into a suitable container. Install caps or plugs in hoses and pump fittings to prevent contamination.

7. Remove two (2) flange head screws (item 22) and flange nuts (item 2) securing the hose bracket to the hydraulic tank. Support the hose bracket and attached hydraulic hoses to prevent the assembly from falling.

8. Support the hydraulic tank to prevent it from moving.

9. Remove four (4) flange head screws (item 3) and flange nuts (item 12) that secure the hydraulic tank to the machine.

10. Remove hydraulic tank from the machine.

11. If fitting removal is necessary, mark fitting orientation to allow correct assembly. Remove fittings and strainer from hydraulic tank (Fig. 8). Discard removed O-rings.

Installation (Fig. 7)

1. If fittings were removed from hydraulic tank, lubricate and place new O-rings onto fittings. Install fittings into tank openings making sure that fitting orientation is as noted during removal. Tighten fittings (see Hydraulic Fitting Installation in the General Information section of Chapter 3 - Hydraulic System).

2. Position hydraulic tank to the machine and secure with four (4) flange head screws (item 3) and flange nuts (item 12).

3. Align the hose bracket and attached hydraulic hoses to the hydraulic tank bracket. Secure the hose bracket with two (2) flange head screws (item 22) and flange nuts (item 2).

4. Remove plugs from hydraulic hoses and tank fittings. Connect hydraulic hoses to hydraulic tank fittings (see Hydraulic Hose and Tube Installation in the General Information section of Chapter 3 - Hydraulic System).

5. Install new O-ring on plug (item 21) used to drain hydraulic tank. Install plug in tank.

6. Fill hydraulic tank with new hydraulic oil.

7. Install twin spinner (or other option) to machine.

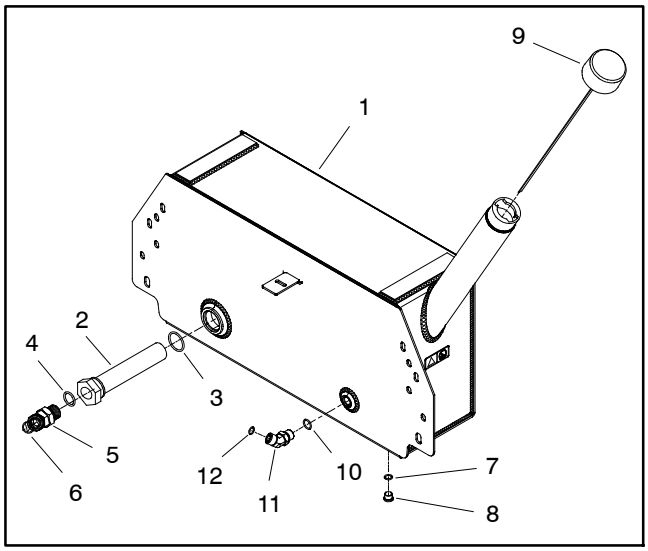

Figure 8

1. **Hydraulic tank**
2. **Strainer**
3. **O-ring**
4. **O-ring**
5. **45º hydraulic fitting**
6. **O-ring**
7. **O-ring**
8. **#6 plug**
9. **Dipstick**
10. **O-ring**
11. **45º hydraulic fitting**
12. **O-ring**

Power Pack Gear Pump

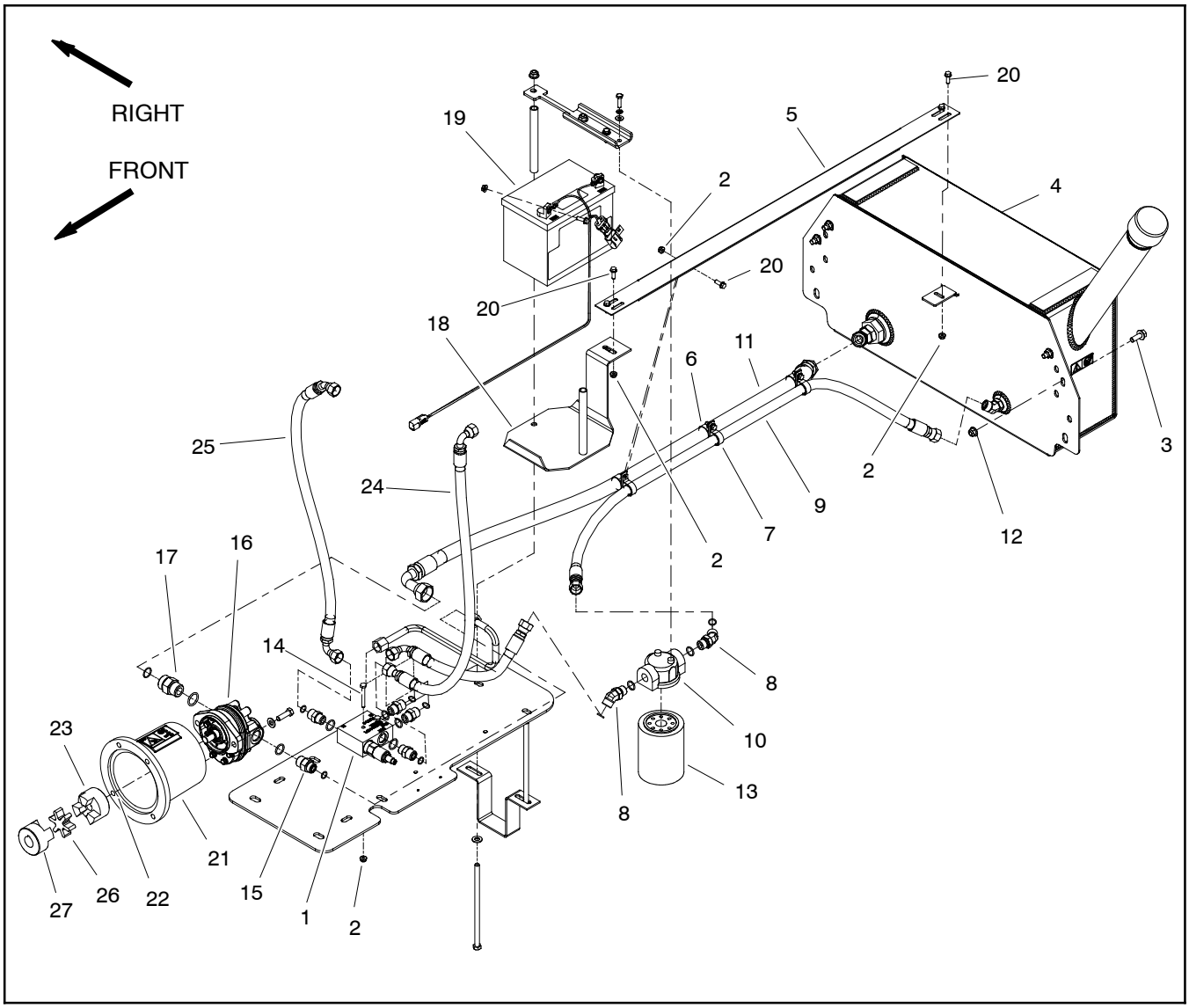

Figure 9

1. Hydraulic relief valve manifold
2. Flange nut (9 used)
3. Flange head screw (4 used)
4. Hydraulic tank assembly
5. Hose bracket
6. R-clamp (3 used)
7. R-clamp (3 used)
8. 45º hydraulic fitting (2 used)
9. Hydraulic hose
10. Filter head
11. Hydraulic hose
12. Flange nut (4 used)
13. Oil filter
14. Cap screw (2 used)
15. Straight hydraulic fitting
16. Hydraulic gear pump
17. Straight hydraulic fitting
18. Battery tray
19. Battery
20. Cap screw (7 used)
21. Flange adapter
22. Key
23. Coupling jaw (gear pump)
24. Hydraulic hose
25. Hydraulic hose
26. Spider coupling
27. Coupling jaw (engine)

Removal (Fig. 9)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Read the General Precautions for Removing and Installing Hydraulic System Components in the Service and Repairs section of Chapter 3 – Hydraulic System.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of Chapter 3 – Hydraulic System.

3. Thoroughly clean junction of hydraulic lines and gear pump fittings. Disconnect hydraulic lines from gear pump. Install caps or plugs in hose, tube and pump fittings to prevent contamination and leakage of hydraulic oil.

4. Support gear pump to prevent it from falling during removal.

5. Remove two (2) cap screws and flat washers that secure pump to flange adapter.

6. Slide gear pump from spider coupling and remove pump (with coupling jaw attached) from the machine.

IMPORTANT: To prevent damage to hydraulic pump, DO NOT hit coupling jaw or pump shaft with a hammer during coupling jaw removal or installation.

7. Loosen set screw that secures coupling jaw to gear pump shaft. Use puller to remove coupling jaw from shaft. Locate and retrieve key from pump shaft.

8. If necessary, remove fittings from pump and discard fitting O–rings (Fig. 10).

Installation (Fig. 9)

1. If fittings were removed from gear pump, lubricate and place new O–rings onto fittings (Fig. 10). Install and tighten fittings into pump ports (see Hydraulic Fitting Installation in the General Information section of Chapter 3 – Hydraulic System).

2. Install key to the pump shaft. Apply antiseize lubricant to gear pump shaft.

3. Slide coupling jaw fully onto pump shaft. Apply Loctite #242 (or equivalent) to coupling jaw set screw. Secure coupling jaw to pump shaft with set screw.

4. Make sure that spider coupling (item 26) is positioned into coupling jaw on engine shaft.

5. Align coupling jaw on pump shaft with spider coupling in engine coupling jaw. Insert coupling jaw on pump shaft into spider coupling and align gear pump mounting holes with flange adapter holes.

6. Secure gear pump to flange adapter with two (2) cap screws and flat washers.

7. Remove plugs from hydraulic hose, tube and pump fittings. Connect hydraulic lines to gear pump (see Hydraulic Hose and Tube Installation in the General Information section of Chapter 3 – Hydraulic System).

8. Check oil level in the hydraulic tank and add correct oil if necessary.

9. Start the engine and operate at idle speed until air is out of hydraulic system.

10. Stop the engine and recheck oil level in tank. Add correct oil if necessary.

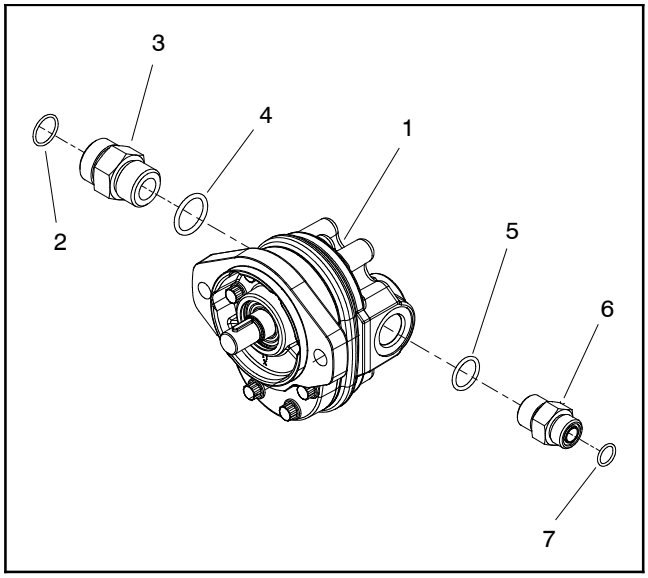

Figure 10

1. **Gear pump**
2. **O–ring**
3. **Hydraulic fitting**
4. **O–ring**
5. **O–ring**
6. **Hydraulic fitting**
7. **O–ring**

Power Pack Gear Pump Service

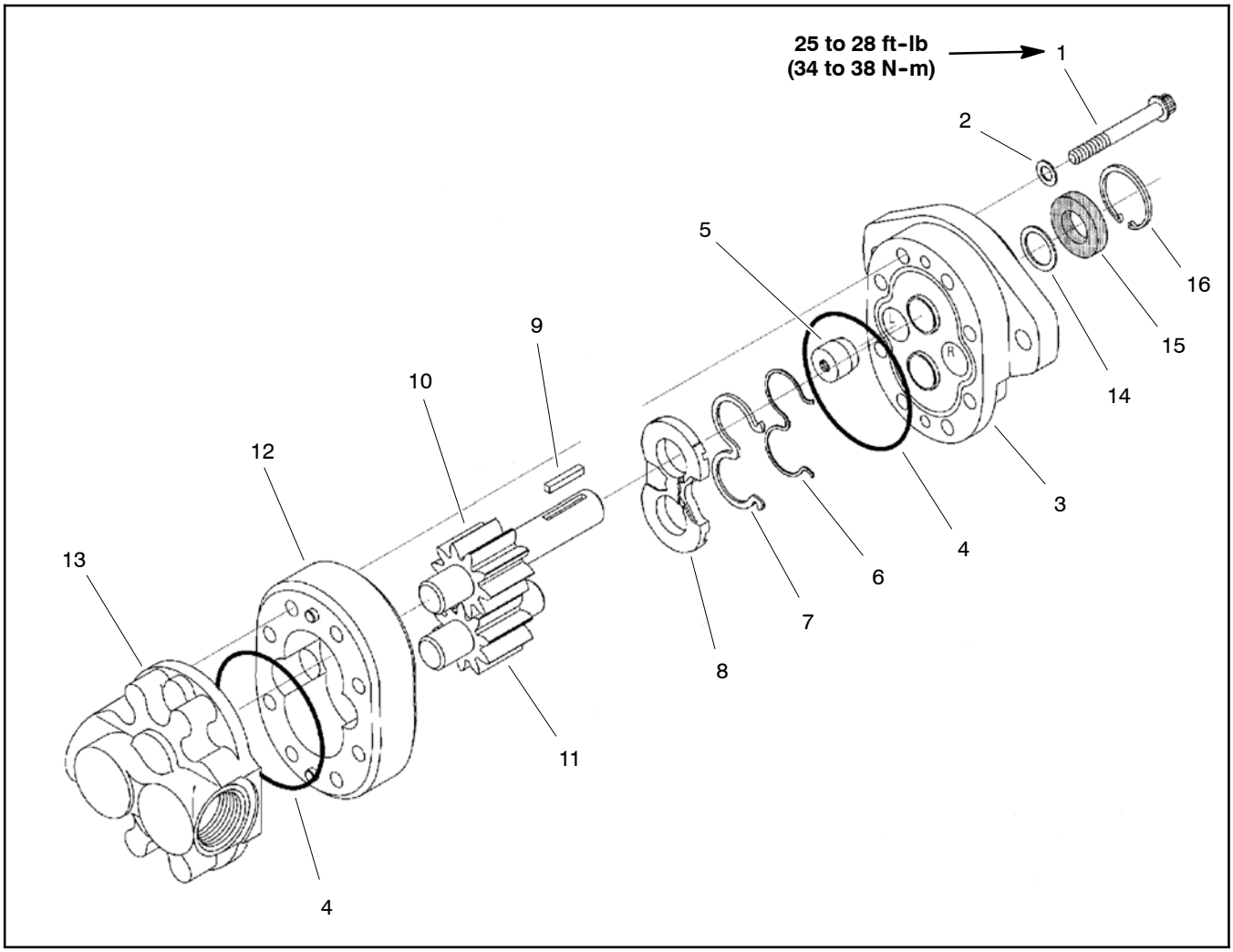

Figure 11

1. **Cap screw (8 used)**
2. **Washer (4 used)**
3. **Front plate**
4. **O-ring (2 used)**
5. **Plug**
6. **Backup gasket**
7. **Seal**
8. **Wear plate**
9. **Key**
10. **Drive gear**
11. **Idler gear**
12. **Body**
13. **Backplate**
14. **Washer**
15. **Seal**
16. **Retaining ring**

NOTE: For service of the power pack gear pump, see the Eaton Series 26 Parts and Repair Manual at the end of this chapter.

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Power Pack Relief Valve

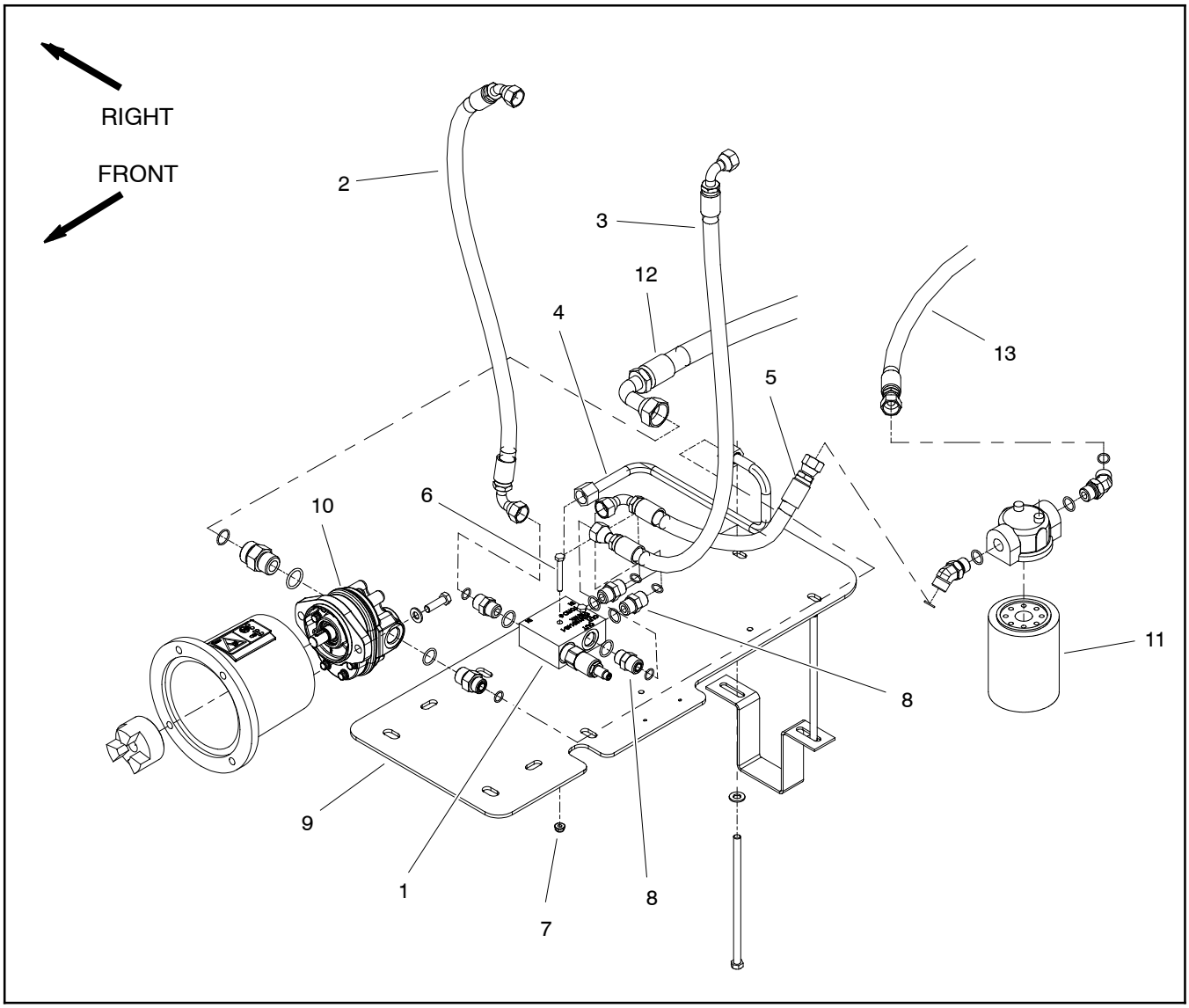

Figure 12

1. **Hydraulic relief valve manifold**
2. **Hydraulic hose**
3. **Hydraulic hose**
4. **Hydraulic tube**
5. **Hydraulic hose**
6. **Cap screw (2 used)**
7. **Flange nut (2 used)**
8. **Straight hydraulic fitting (4 used)**
9. **Engine mount plate**
10. **Gear pump**
11. **Oil filter**
12. **Hydraulic hose (from tank)**
13. **Hydraulic hose (to tank)**

Removal (Fig. 9)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving.

2. Read the General Precautions for Removing and Installing Hydraulic System Components in the Service and Repairs section of Chapter 3 – Hydraulic System.

CAUTION

Before disconnecting any hydraulic components, operate all hydraulic controls to relieve system pressure and avoid injury from pressurized hydraulic oil. See Relieving Hydraulic System Pressure in the General Information section of Chapter 3 – Hydraulic System.

3. Thoroughly clean junction of hydraulic lines and relief valve manifold fittings.

4. Label all hydraulic lines for assembly purposes.

5. Disconnect hydraulic lines from manifold fittings. Install caps or plugs in hoses, tube and manifold fittings to prevent contamination and leakage of hydraulic oil.

6. Remove two (2) cap screws and flange nuts that secure manifold to engine mount plate.

7. Remove relief valve manifold from machine.

8. If necessary, remove hydraulic fittings from manifold. Discard removed O−rings.

9. If necessary, remove relief valve from manifold with a deep well socket (Fig. 14). Note location of O−rings and backup rings on valve. Remove and discard removed seal kit.

Installation

1. If relief valve was removed from manifold, install relief valve (Fig. 14):

   A. Lubricate new O-rings and backup rings of seal kit with clean hydraulic oil and install on cartridge. The O-rings and backup rings must be arranged properly on the cartridge valve for proper operation and sealing.

   IMPORTANT: Use care when installing the relief valve. Slight bending or distortion of the stem tube can cause binding and malfunction. Make sure that deep well socket fully engages the valve base.

   B. Lubricate cartridge threads with clean hydraulic oil. Thread cartridge valve carefully into correct manifold port. The valve should go in easily without binding.

   C. Torque cartridge valve using a deep well socket to **25 ft−lb (34 N−m)**.

2. If fittings were removed from manifold, lubricate and place new O−rings onto fittings (Fig. 10). Install and tighten fittings into manifold ports (see Hydraulic Fitting Installation in the General Information section of Chapter 3 − Hydraulic System).

3. Position relief valve manifold to engine mount plate and secure with two (2) cap screws and flange nuts.

4. Remove caps and plugs from hoses, tube and manifold fittings. Connect hydraulic lines to manifold (see Hydraulic Hose and Tube Installation in the General Information section of Chapter 3 − Hydraulic System).

5. Check oil level in the hydraulic tank and add correct oil if necessary.

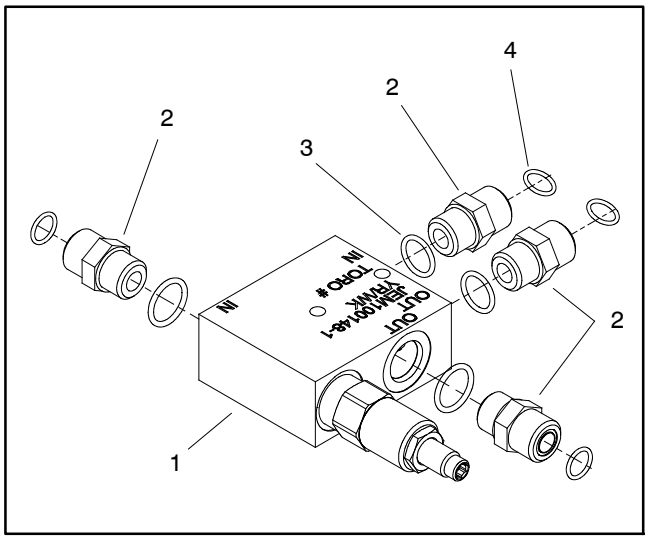

Figure 13

1. **Relief valve manifold**
2. **Straight fitting (4 used)**
3. **O−ring**
4. **O−ring**

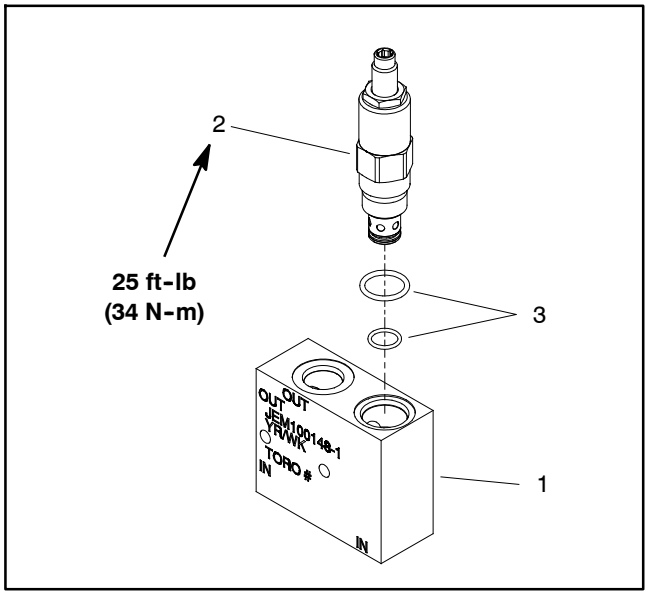

Figure 14

1. **Relief valve manifold**
2. **Relief valve**
3. **Seal kit**

Power Pack Battery

The battery is the heart of the electrical system. With regular and proper service, battery life can be extended. Additionally, battery and electrical component failure can be prevented.

WARNING

POTENTIAL HAZARD:
Either the battery terminals or metal tools could short against metal vehicle components.
WHAT CAN HAPPEN:
Sparks can cause the battery gasses to explode.
Damaged cables could short against metal vehicle components and cause sparks.
HOW TO AVOID THE HAZARD:
When removing or installing the battery, do not allow the battery terminals to touch any metal parts of the vehicle.
Always DISCONNECT the negative (black) battery cable before disconnecting the positive (red) cable.
Always CONNECT the positive (red) battery cable before connecting the negative (black) cable.
Do not allow metal tools to short between the battery terminals and metal parts of the vehicle.
Always keep the battery retaining components secure to protect the battery.

Battery Specifications

BCI Group Size U1
300 Amp Cranking Performance at 0° F (-18°C)
28 Minutes Reserve Capacity at 80°F (27°C)

Electrolyte Specific Gravity

Fully charged: 1.265 corrected to 80°F (27°C)
Discharged: less than 1.240

Removal (Fig. 15)

1. Position machine on a level surface. If ProPass is attached to tow vehicle, apply tow vehicle parking brake, stop engine and remove key from the ignition switch. Chock wheels to prevent ProPass machine from moving. Make sure that key switch on power pack engine is in the OFF position.

IMPORTANT: Be careful to not damage terminal posts or cable connectors when removing the battery cables.

2. Disconnect negative (black) cable from battery first to prevent short circuiting the battery, other components or operator's hands. Then disconnect positive (red) cable.

3. Loosen cap screw and flange nut that secure the battery bracket closest to hydraulic oil filter. Remove cap screw, flat washer, flange nut and bolt tube that secure bracket opposite the oil filter.

4. Make sure that battery filler caps are on tightly.

5. Remove battery from chassis to a service area. This will minimize possible battery damage and allow better access for battery inspection and service.

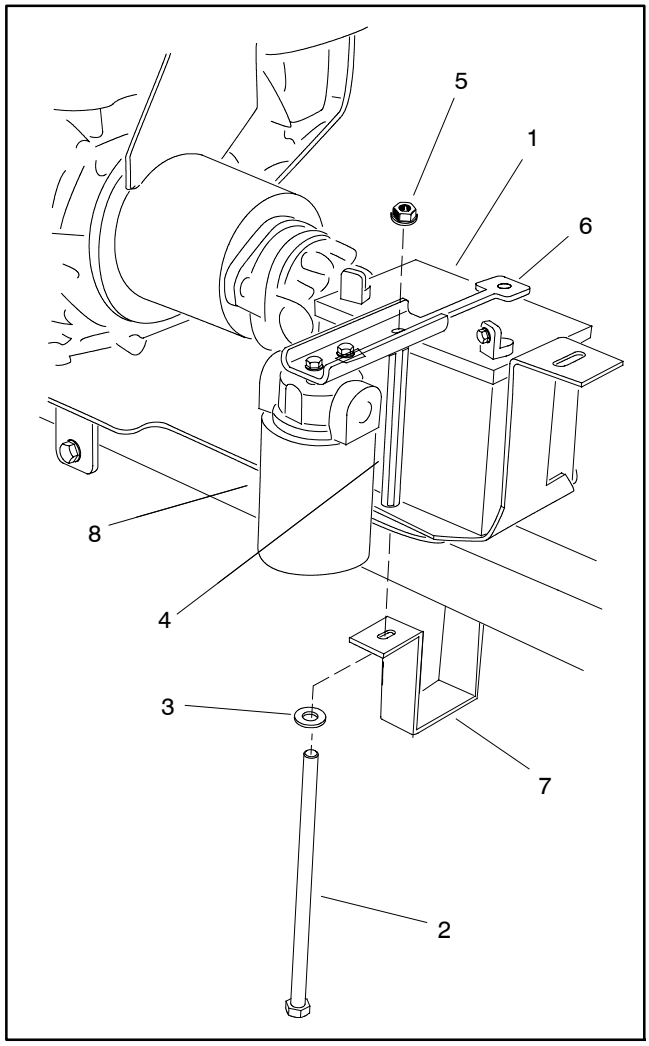

Figure 15

1. **Battery**
2. **Cap screw (2 used)**
3. **Flat washer (2 used)**
4. **Bolt tube (2 used)**
5. **Flange nut (2 used)**
6. **Battery bracket**
7. **Mounting strap**
8. **Hydraulic oil filter**

Battery Inspection and Maintenance

WARNING

POTENTIAL HAZARD:
Battery electrolyte contains sulfuric acid which is a deadly poison and it causes severe burns.
WHAT CAN HAPPEN:
If you carelessly drink electrolyte you could die or if it gets onto your skin you will be burned.
HOW TO AVOID THE HAZARD:
Do not drink electrolyte and avoid contact with skin, eyes or clothing. Wear safety glasses to shield your eyes and rubber gloves to protect your hands.
Fill the battery where clean water is always available for flushing the skin. Always RECONNECT the positive (red) battery cable before reconnecting the negative (black) cable.
Follow all instructions and comply with all safety messages on the electrolyte container.

1. Check for cracks caused by overly tight or loose hold down rod. Replace battery if cracked and leaking.

2. Check battery terminal posts for corrosion. Use a terminal brush or steel wool to clean corrosion from the battery terminal posts.

IMPORTANT: Before cleaning the battery, tape or block the vent holes to the filler caps and make sure the caps are on tightly.

3. Check for signs of wetness or leakage on the top of the battery which might indicate a loose or missing filler cap, overcharging, loose terminal post or overfilling. Also, check the battery case for dirt and oil. Clean the battery with a solution of baking soda and water, then rinse it with clean water.

4. Check that the cover seal is not broken away. Replace the battery if the seal is broken or leaking.

5. If battery caps can be removed, check the electrolyte level in each cell. If the level is below the tops of the plates in any cell, fill all cells with **distilled** water to the bottom of the cap tubes (or fill line). Charge at 3 amps for 15 minutes to allow sufficient mixing of the electrolyte.

6. Make sure battery cables, battery connections and the battery hold down components are in good condition. Also, make sure the battery tray is clean and repainted if necessary.

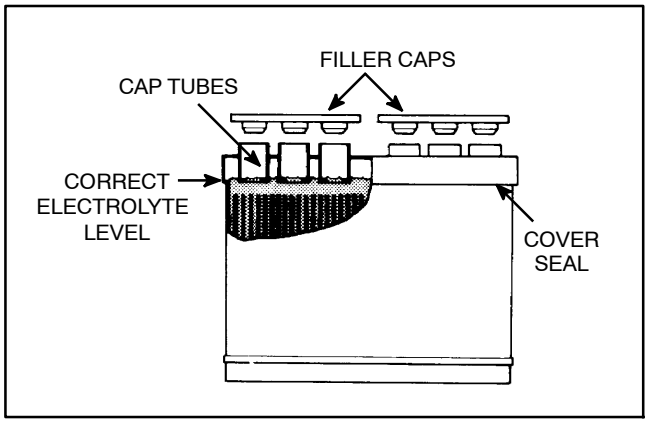

Figure 16

Battery Installation (Fig. 15)

IMPORTANT: To prevent possible electrical problems, install only a fully charged battery.

1. Make sure the ignition switch on the power pack engine and all accessories are OFF.

2. Position the battery on the battery base with its posts toward the hydraulic oil filter.

3. Secure positive cable (red) to positive battery post with flange head screw and flange nut.

4. Position bolt tube, cap screw, flat washer and flange nut to battery bracket and battery tray opposite the oil filter. Tighten cap screws and flange nuts on both sides of the battery bracket to secure the battery to the machine.

5. Connect a digital multimeter (set to amps) between the negative battery post and the negative cable (black) connector. The reading should be less than 0.1 amp. If the reading is 0.1 amp or more, the power pack electrical system should be tested and repaired.

6. Secure negative cable (black) to negative battery post with flange head screw and flange nut.

7. Apply battery terminal protector (see Special Tools in this chapter) on battery posts and cable connectors to reduce corrosion after connections are made.

Battery Testing

1. If battery caps can be removed, conduct a hydrometer test of the battery electrolyte:

IMPORTANT: Make sure the area around the cells is clean before opening the battery caps.

A. Measure the specific gravity of each cell with a hydrometer. Draw electrolyte in and out of the hydrometer barrel prior to taking a reading to warm-up the hydrometer. At the same time take the temperature of the cell.

B. Temperature correct each cell reading. For each 10°F (6°C) above 80°F (27°C) add 0.004 to the specific gravity reading. For each 10°F (6°C) below 80°F (27°C) subtract 0.004 from the specific gravity reading.

Example:	Cell Temperature	100°F
	Cell Gravity	1.245
	ADD (20° above 80°F)	0.008
	Correction to 80°F	1.253

C. If the difference between the highest and lowest cell specific gravity is 0.050 or greater or the lowest cell specific gravity is less than 1.225, charge the battery. Charge at the recommended rate and time given in **Battery Charging** or until the specific gravity of all cells is 1.225 or greater with the difference in specific gravity between the highest and lowest cell less than 0.050. If these charging conditions can not be met, replace the battery.

2. Perform a high-discharge test with an adjustable load tester.

This is one of the most reliable means of testing a battery as it simulates the cold-cranking test. A commercial battery load tester is **required** to perform this test.

CAUTION

Follow the battery load tester manufacturer's instructions when using a load tester.

A. Check the voltage across the battery terminals prior to testing the battery. If the voltage is less than 12.0 VDC, recharge the battery before load testing.

B. Make sure the battery terminals are free of corrosion.

C. If the battery has been charged, apply a 150 amp load for fifteen (15) seconds to remove the surface charge. Use a battery load tester following the manufacturer's instructions.

D. Measure the temperature of the electrolyte in the center cell.

E. Connect a battery load tester to the battery terminals **following the manufacturer's instructions**. Connect a digital multimeter to the battery terminals.

F. Apply a test load of 150 amps (one half the battery CCA performance) for fifteen (15) seconds.

G. Take a battery voltage reading after fifteen (15) seconds, then remove the load. Record this test voltage reading.

H. Using the table below, determine the minimum test voltage for the cell temperature reading.

Minimum Test Voltage	Battery Electrolyte Temperature	
9.6	70°F (and up)	21°C (and up)
9.5	60°F	16°C
9.4	50°F	10°C
9.3	40°F	4°C
9.1	30°F	-1°C
8.9	20°F	-7°C
8.7	10°F	-12°C
8.5	0°F	-18°C

I. If the test voltage is below the minimum, replace the battery. If the test voltage is at or above the minimum, return the battery to service.

Battery Charging

To minimize possible damage to the battery and allow the battery to be fully charged, the slow charging method is presented here. This charging method can be accomplished with a constant current battery charger which is available in most service shops.

CAUTION

Follow the battery charger manufacturer's instructions when using a battery charger.

NOTE: Using specific gravity of the battery cells is the most accurate method of determining battery condition.

1. Determine the battery charge level from either its open specific gravity or circuit voltage.

Battery Charge Level	Specific Gravity	Open Circuit Voltage
100%	1.265	12.68
75%	1.225	12.45
50%	1.190	12.24
25%	1.155	12.06
0%	1.120	11.89

2. Determine the charging time and rate **using the battery charger manufacturer's instructions** or the following table.

Battery Reserve Capacity (Minutes)	Battery Charge Level (Percent of Fully Charged)			
	75%	50%	25%	0%
80 or less	**3.8 hrs @ 3 amps**	**7.5 hrs @ 3 amps**	**11.3 hrs @ 3 amps**	**15 hrs @ 3 amps**
81 to 125	5.3 hrs @ 4 amps	10.5 hrs @ 4 amps	15.8 hrs @ 4 amps	21 hrs @ 4 amps
126 to 170	5.5 hrs @ 5 amps	11 hrs @ 5 amps	16.5 hrs @ 5 amps	22 hrs @ 5 amps
171 to 250	5.8 hrs @ 6 amps	11.5 hrs @ 6 amps	17.3 hrs @ 6 amps	23 hrs @ 6 amps
above 250	6 hrs @ 10 amps	12 hrs @ 10 amps	18 hrs @ 10 amps	24 hrs @ 10 amps

CAUTION

Do not charge a frozen battery because it can explode and cause injury. Let the battery warm to 60°F (16°C) before connecting to a charger.

Charge battery in a well-ventilated place to dissipate gases produced from charging. These gases are explosive.

Keep open flame and electrical spark away from the battery. Do not smoke. Unplug the charger from the electrical outlet before connecting or disconnecting the charger leads from the battery posts.

Nausea may result if the gases are inhaled.

3. **Follow the battery charger manufacturer's instructions.** Connect charger cables to the battery. Make sure a good connection is made.

4. Charge the battery **following the battery charger manufacturer's instructions**.

5. Occasionally check the temperature of the battery electrolyte. If the temperature exceeds 125°F (52°C) or the electrolyte is violently gassing or spewing, the charging rate must be lowered or temporarily stopped.

6. Three (3) hours prior to the end of the charging, measure the specific gravity of a battery cell once per hour. The battery is fully charged when the cells are gassing freely at a low charging rate and there is less than a 0.003 change in specific gravity for three (3) consecutive readings.

Battery Storage

If the vehicle will be stored for more than thirty (30) days, remove the battery and charge it fully. Either store it on the shelf or on the vehicle. Leave the cables disconnected if it is stored on the vehicle. Store the battery in a cool atmosphere to avoid quick deterioration of the charge in the battery. To prevent the battery from freezing, make sure it is fully charged.

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